

The Setting: SPACE/Orlando '83

"Senator — May I demonstrate
our satellite TV receiver"?

(Under breath)
'Alright baby — do your thing'!

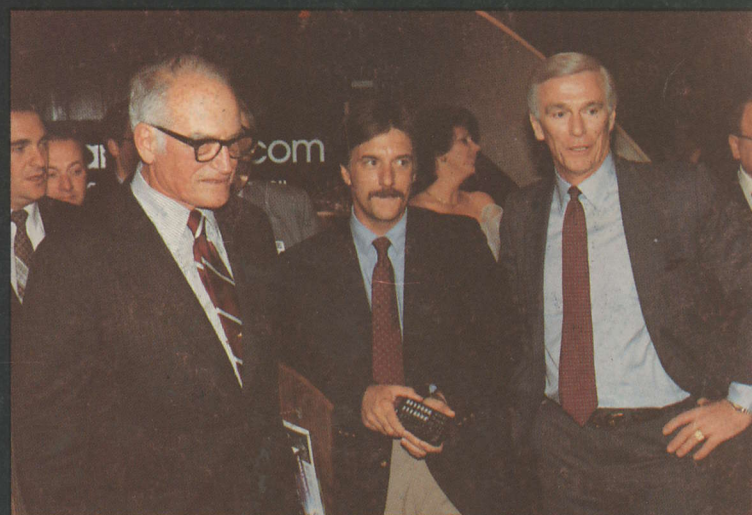
COOP'S SATELLITE DIGEST



DECEMBER 1983

(Reaching for keypad control)
"You mean that little hand held
control does ALL of that"!

(Looking closely at receiver)
"Where the hell are
the knobs"?



Time to upgrade . . . ?



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TOP OF THE MONTH

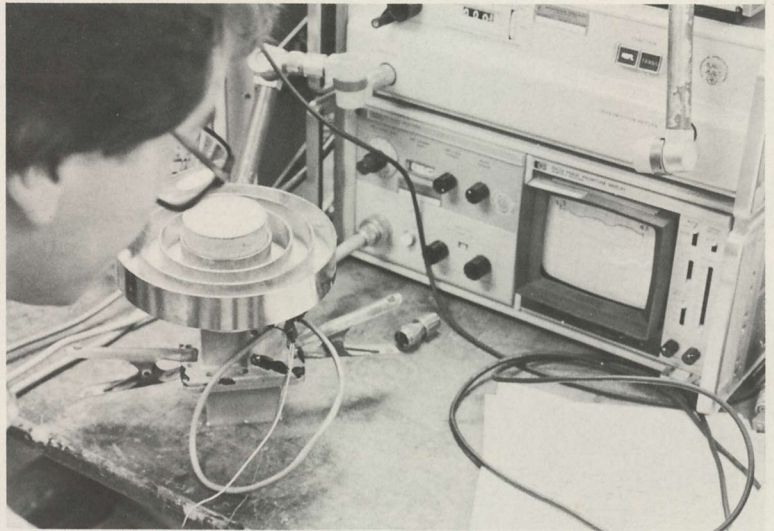
FEEDS. Separating the product hype from the product fact. We have been 'taught' that the design of the feed is the 'key' to the performance of the antenna, and hence the full TVRO system. BUT, there are many different approaches to feed design. Some swear 'by' certain product designs, others swear 'at' other product designs. We look at feeds, on an antenna test range, here this month. And explode some popular feed 'myths.'

ADM come back? Most of the 'old timers' in this industry started off dealing in ADM antennas. That was probably because ADM was the first manufacturer to address mass-produced, low-cost TVRO antennas. In the past year the ADM share-of-market has slipped as the marketplace has exploded in size. Some newer designs, such as the Paraclipse 12 footer, have taken over the top selling spots. But ADM has a new 11 footer and it looks like a winner. We find how good it is on the Provo 'down-field' test range.

SDS. We coined it. It means **Satellite Distribution Service**. And it means that you can re-transmit, through the air, 12 or more satellite TV channels to as many individual homes as you can equip with block-down-conversion type TVRO receivers in say a 2 to 5 mile radius of your TVRO antenna. Is it a practical answer to low-cost sharing of TVRO signals? Is it legal? We find out, here, this month.

DECEMBER 1983

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OUR COVER/ During the **SPACE '83** show in Orlando, **U.S. Senator Barry Goldwater**, after addressing the Friday evening banquet crowd, toured the exhibit hall. There, **Inter-sat's David McClaskey**, **Astronaut Gene Cernan** and the Senator held 'school' on TVRO receiver technology. McClaskey and Cernan were the teachers; the Senator the 'student.' YES—he really did exclaim 'Where the hell are the knobs?'

COOP'S SATELLITE DIGEST



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HURRICANE

Your new antenna is all set up, adjusted, fine tuned and the service technician is on his way back to the shop. Now the real test begins. Will it continue to perform? For how long will it maintain the picture quality it has today?

Your antenna will have to face the wind and weather every hour of every day of its life. This will be its toughest test. To survive, you'll need equipment strong enough to take whatever nature can throw at it. You'll need Paraclipse.

It is impossible to gather conclusive data about the effects of storm generated stress on an antenna unless you can control the storm. We wanted to put our equipment through an intense, concentrated weather test to measure its



PIONEER MEMBER OF
SPACE



Paracclipse

HIGH PERFORMANCE SATELLITE TELEVISION SYSTEM

performance, so we hired a "professional hurricane" to see if we could break a Paracclipse.

We dumped 337 gallons of water per minute into a 95 mph windstream to create the wind load equivalent of a 140 mph storm. Each antenna was tested at five different elevation settings and was blasted from eight different angles.

After several hours of abuse, both Paracclipse antennas emerged undamaged and in perfect shape. Off-air satellite signal evaluation at the end of the tests, indicated the Paracclipse antennas maintained the same electrical parameters as prior to the tests. After testing, measurements show no warping or distortion of the welded aluminum truss structure or mount assembly. Both antennas, in spite of loads to which they were subjected, maintained parabolic symmetry and accuracy. Neither antenna suffered any damage; not one piece of mesh was bent or one clip lost. Both antennas were absolutely stock items assembled according to standard instructions.

The welded aluminum Rib & Ring Truss System pioneered by Paracclipse is still the lightest, strongest, most accurate design available. The concentric ring trusses, to which the heavy expanded aluminum mesh is fastened, form a perfect compound parabolic shape that even a hurricane can't bend. The all steel polar mount and base are powder coated to further seal and protect them from the elements.

A Paracclipse system has the structural strength and dimensional stability to maintain the integrity of its parabolic shape under the worst of conditions. Paracclipse materials are chosen for their lightweight strength and corrosion resistant properties. Every aspect of the Paracclipse design represents strength in performance.

Paracclipse, strong, lightweight, weatherproof, shippable, easily assembled with simple hand tools, an affordable quality antenna from a very reputable manufacturer.

Dollar for dollar, you just can't buy more performance.

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COOP'S SATELLITE COMMENT

- PRELIMINARY ORLANDO Observations
- THE CBI Squabble
- NEXT MONTH Starts A New Year
- THIS TIME/ The Japanese ARE Coming!

SPACE A-Go-Go

If the Society for Private and Commercial Earth stations was looking for a 'launch' of their accelerated convention and seminar program, they got what they wanted in Orlando. The show was a complete sellout at virtually all levels and a resounding success according to exhibitors and attendees alike.

That sounds like a bunch of hype from someone who admits to having a deep seated interest in the success or failure of a SPACE show. However, I invite those who disagree with that assessment to put their thoughts on paper and drop them to CSD. I will, as always, publish a balanced, representative sampling of all comments received.

The biggest news first. SPACE, through a negotiating team made up of KLM's **Peter Dalton**, and, **Taylor Howard**, finally broke through the 'barrier' and worked out an arrangement with STTI's **Rick Schneringer**. The first hurdle, the forthcoming twin shows scheduled by both SPACE and STTI for a week apart in Las Vegas this March, will now be held jointly. SPACE will operate the program and STTI will handle the exhibits. A similar arrangement is planned for the remainder of the 1984 shows and thus ends the era of SPACE conducting **their** trade shows and STTI conducting **their** trade shows with the eternal conflict such an arrangement creates.

The second biggest news next; new SPACE Board Chairman for 1984 is Paradigm's **David Johnson**. New President is KLM's **Peter Dalton**. The new Secretary is R.L. Drake's **Ron Wysong**. Former SPACE President **Bob Behar** will be Treasurer in 1984. VP **Richard L. Brown** was re-elected to his post where he also serves as General Counsel.

There was not a wide variety of new hardware. Drake introduced a new receiver; Winegard introduced a novel new 10 foot antenna and followed that up with the announcement that a test marketing program involving 8 foot antennas is currently underway at 150 Montgomery Wards stores in the mid-west. **Ahead is the carrot;** if they manage to 'move' a (mere) 500 TVROs this fall (including the Christmas selling season), MW indicates that the terminals could end up with two color pages of display in the next annual catalog. Winegard affiliates will handle the installation for the Wards stores. There were several new (oriental manufactured) LNAs including one that has the endorsement of industry pioneer **Robert Coleman**.

We talked with many of the larger equipment producers and distributors and found a surprising amount of agreement on just how much bigger the industry is apt to be in calendar 1984. Virtually everyone felt that the 12 month average for 1984 would **double** the 1983 numbers, so if you can figure out how well we did **this year, you now have a handle on 1984!** There was considerable speculation about just when various 'major' electronic suppliers in the consumer home-electronics field would 'jump into' the 4 GHz (DBS) world, and again we found considerable agreement. Most were betting that one or more 'major firms' would break TVRO products at the summer of '84 Consumer Electronics Show (CES). Few would speculate, however, **who might be first to announce**, or, what impact (if any) such an announcement might have on the 1984 delivery (as opposed to sales) season.

More statistics. All 200 plus booths had been sold out weeks prior to the show and there was a waiting list for any that might drop out. All

900 banquet seats were sold out long before the event and as we shall see, headliners **Ted Turner** and **Senator Barry Goldwater** turned in excellent 'performances.' Breakfast meetings toasting **Congressmen Billy Tauzin** and **Charlie Rose** were well attended. The politics of SPACE was in high gear and clicking smoothly.

Someplace in all of this festivity while the SPACE Board was holding a special meeting to hear a report from new Prexy Peter Dalton and Taylor Howard on the proposal to jointly run the Las Vegas Show in March with STTI, **Ted Turner** arrived. "He's sitting out there with his wife Jane manning the CNN booth in the exhibit hall area," came the report. "Can you imagine Turner sitting out there running the booth!". We could, and an entourage promptly vacated the Board meeting to find the Atlanta entrepreneur.

"Hey, can I get on early," he quickly asked. "I need to get back to Atlanta and I'd sure appreciate being able to get back in the air by 9 or so." Turner had actually been scheduled to speak in front of the dinner and to lead the way for Senator Barry Goldwater. "I never heard of a banquet with TWO featured speakers," he noted as we drifted down the aisles. A considerable crowd followed, behind, alongside and out in front. Camera flashes went off constantly; you'd think he was a political big wig or something.



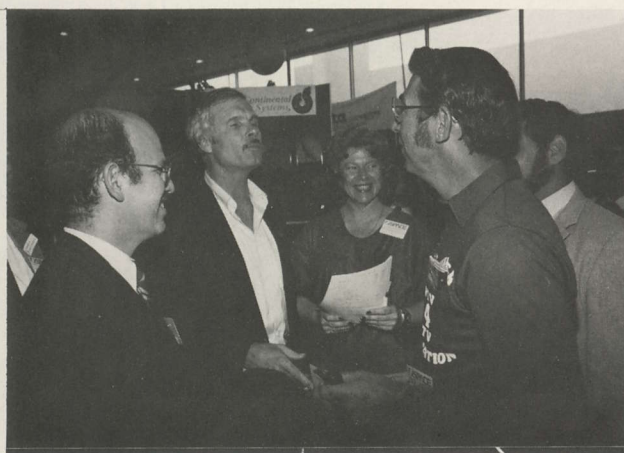
TURNER and wife Jane 'manning' the CNN Booth at Orlando.



"TED/ There seems to be some confusion as to whether your TVRO was first or not."



"I recall there were two licenses granted by the FCC; you got one to haul a TVRO around on a trailer so you could watch the Braves games while you were busy beating the Australians in Newport. I got one so I could start this industry."



"YEH/ mine cost \$20,000 and it was a monster. We sure showed that FCC didn't we! Say, what did YOU ever do with yours, anyhow?"



RICK BROWN/ "Turner sure knows how to hurt a guy!"

The lady grabbed his hand. **"You are my hero,"** she said shaking his hand vigorously. "Are you going to run for President in 1984?", apparently alluding to the proliferation of bumper stickers in Florida and Georgia proclaiming 'Draft Ted Turner in '84.' "Honey, I'd run for anything if I thought I could win," he smiled back.

"Hey look at this," he said to nobody in particular, passing an antenna set up inside a booth. **"Is THAT the RIGHT price?"** he asked loudly. The lady 'manning' the booth rushed to answer his query. She mistook his question about price, assuming he thought it was too high. It said the dish system and drive was \$1295.

"We can make you a better deal," she cooed. "Hell, I remember when I spent \$20,000 for my first dish system," he recollected. "Are you **sure** this is the **RIGHT** price?" He was assured it was. "Hell of a deal," he suggested walking on down the aisle.

"I'm Morgan Bojorquez from San Salvador, El Salvador," the man said introducing himself to the wandering Turner. **"You get CNN down there?"** Turner wanted to know. "It is **THE** most important channel in Central America on satellite," responded Bojorquez. Turner wanted to know why, beaming as he asked. The man from Atlanta was obviously very proud of his CNN product.

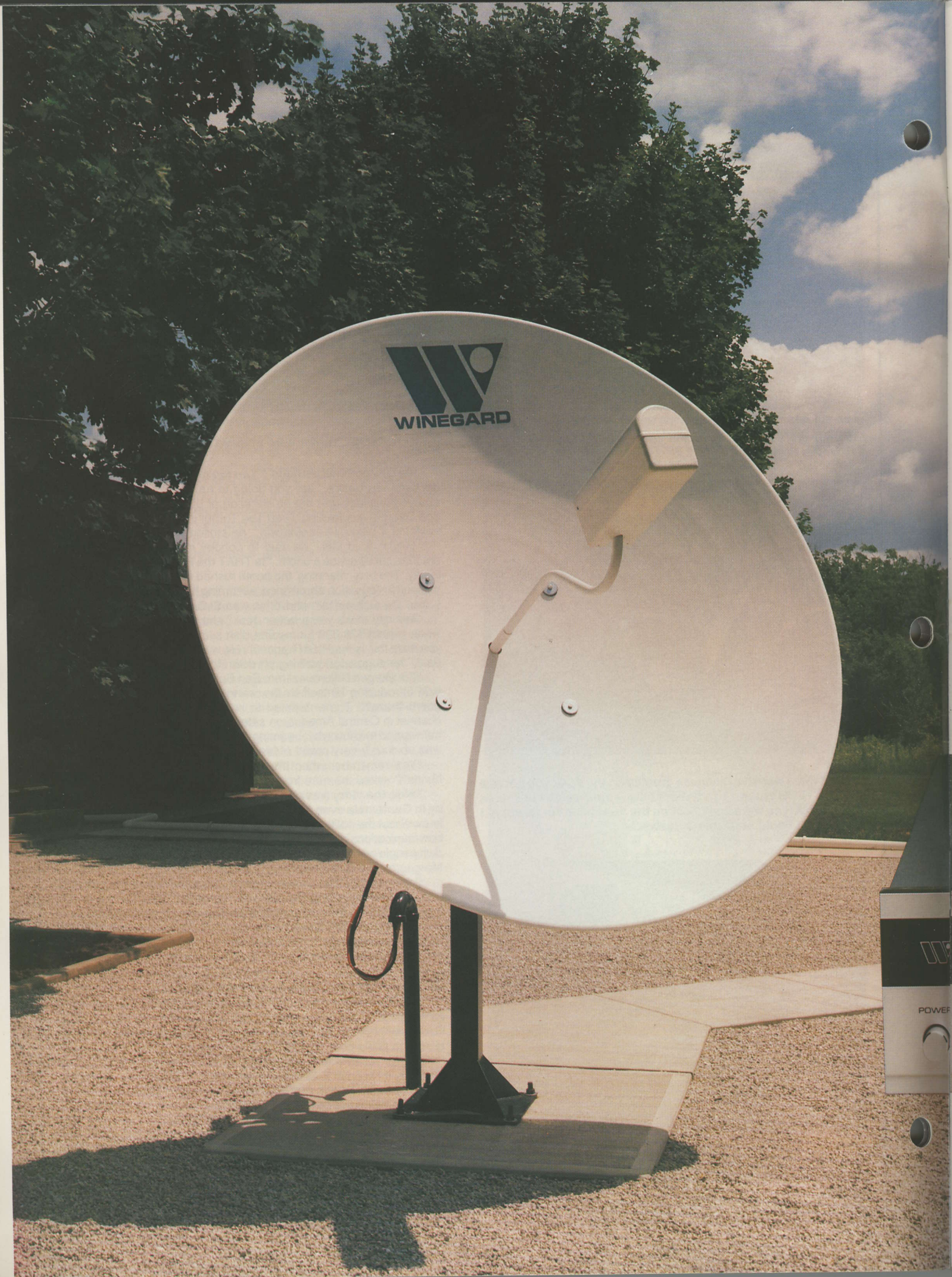
"You remember when the Guatemala political regime changed hands?" asked the man from San Salvador. Turner nodded.

"Well, the story was on CNN 20 minutes before the US embassy in Guatemala even knew it from their local sources. They actually knew about the political change faster through CNN than from the US communications network. You beat the US government, telling their own people what was happening!" Turner smiled deeply and thanked Morgan for the compliment.

Several hours later Turner would be standing before the gathered 900 plus attendees at the SPACE banquet. **"We** are all in this together," he led the podium. **"We** are changing the face of America, and now the world!". The crowd applauded. He made no spectacular announcements, talked not about his most recent take over of SNC nor about the on again-off again discussions with CBS. He did allude to it at one point noting, "I used to think the networks were **soooo** big; I don't think CBS is so big anymore." He brought the house down.

Whether Turner had been adequately briefed or not about the composition of the group was difficult to ascertain. He has carefully filed away phrases that he can drag out of memory to suit the occasion. "I'm just a poor boy from Georgia," he started out at one point. "We have yet to make any money at what we are doing. Maybe someday if I keep at it, I'll make some money." That drew several low murmurs in the crowd; probably those who were aware that Turner owns approximately 85% of the outstanding stock in TBS himself and that some of the numbers kicking around when the CBS deal was surfacing had his holdings in TBS valued at more than \$500,000,000. That was a Bill Young kind of number!

Turner's appearance, true to form, was upbeat, comical, and



DESIGNED FOR THOSE WHO TAKE THEIR SATELLITE TV SERIOUSLY!

Sharp, clear pictures. That's what you expect from a sophisticated home satellite TV system. And that's what you get from Winegard!

The new SC-5000S motorized 8-foot package includes a sophisticated satellite video receiver for a dramatic difference in satellite TV reception. You get superb features like an audio tune control to adjust to any frequency in the 5.5 to 8.0MHz range; signal strength meter for precise antenna alignment; fine tune control to lock in the best picture on each channel; rapid scan control for locating satellites and positioning the antenna; channel select control with LED channel read-out; a polarity switch for satellites where polarization is reversed; a built-in satellite select knob with LED read-out moves the dish east or west. The receiver also features a built-in, selectable channel 3 or 4 modulator. A downconverter is included that mounts directly to the LNA at the feedhorn, eliminating line loss.

The sleek new receiver has rear panel connections for optional remote channel control; audio output for stereo processor and connections for Winegard's satellite selector. Each and every unit must pass our rigid quality control standards.

EVERYTHING YOU'D EXPECT BUT MORE. . .

Winegard's 8-foot dish is one you can handle anywhere! Easy to inventory, easy to transport, and best of all, simple to install! Weighs only 60 pounds and requires no more than four hours installation.

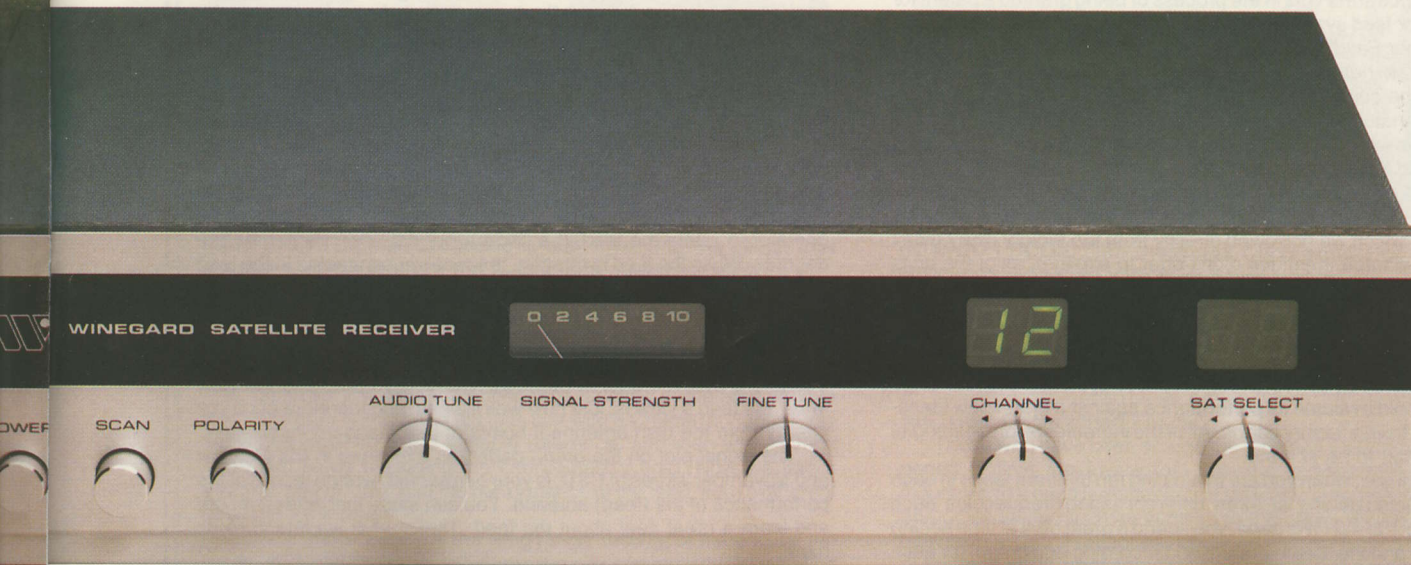
It covers the 3.7 - 4.2GHz band efficiently with 37.5dB gain. Wind survival is 90 mph. The feed is prime focus and enclosed in a weather-tight shroud along with a Polarotor™ automatic polarity unit, LNA and converter.

The 8-foot dish is heavy .090-gauge spun aluminum. A special weather-resistant, baked epoxy paint in parchment white provides long-life and attractive appearance.

For installation convenience, Winegard offers two types of rugged polar mounts — "pedestal" with a base that secures to a concrete pad or "post mount" that sinks into a cement base 18" in diameter and 4' deep. The Winegard 8-foot package is 100% complete, even includes 150' cable.

THINKING TVRO?. . . LOOK AT WINEGARD!

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ON THE SAN DIEGO TEST RANGE

THE Nitty Gritty

Early in October, following up on our prior visit to the **Microwave Specialty Corporation** test range in San Diego (see **CSD**; October, November 1983), we returned with an expanded group of people and several suitcases filled with representative feeds from the (home) TVRO industry. We had arranged with MSC to allow a series of tests on the feed devices using their range facility, engineers and technicians. Those who attended the Orlando SPACE Convention early in November had the opportunity to hear MSC's **Duane Tubbs** explain how antennas and feeds are 'calibrated' on a test range.

Joining us for the exercise was **Gary Olsen** of Recreational Sports & Imports of Idaho Falls, Idaho (a TVRO distribution firm), **Doug Dehnert** of United Satellite Systems (a supplier of TVRO electronics and antennas) and **Tom Harrington** of Coax Seal and Universal Electronics. The testing was scheduled to eat up two full days and we ran over at that. When we were all done, we hoped we would know more about the variations in the available feeds offered to the TVRO industry, why those variations occurred, and how the dealer could translate this information into a more intelligent 'selection process' when evaluating feeds offered to him.

Coincidental with the feed testing, there were some things happening in the feed marketplace. As we shall see next month, **Chaparral Communications** was in the process of being granted a patent for their Polarotor feed system as well as a 'graphic' or 'art' design patent for their 'Super Feed' system. Thus the testing aside, the marketing forces at work here were headed for some potentially dramatic changes in the coming months.

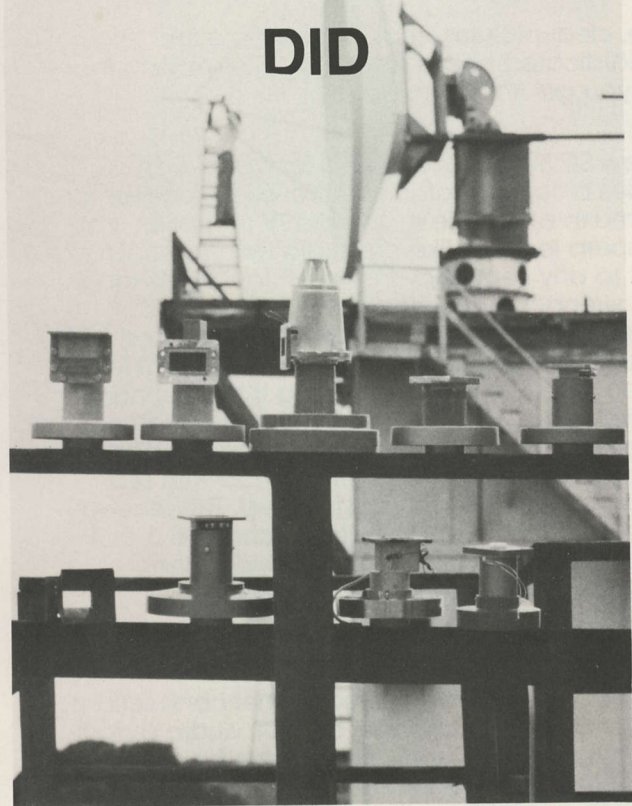
Only a handful of people knew in advance of our San Diego feed testing that we were (1) **selecting** feeds for evaluation, and, (2) **taking** those feeds to MSC to be tested. We went into the open marketplace and obtained approximately a dozen feeds through various distributors and off of people's shelves. With the exception of some new Boman units which we borrowed directly from the factory (they didn't ask why we wanted them; we didn't offer to explain), all of the units simply came out of the industry through normal channels.

Additionally, we hauled a Chaparral Polarotor device from the Turks and Caicos Islands, carefully removing it from active service just before heading for San Diego. Our objective here was to take a weather-beaten, salt-corrosion exposed feed system to the test range so that we could evaluate its performance against a brand new identical unit fresh from a factory carton. All of the ingredients for meaningful testing seemed to be at hand.

As you will see, when you are evaluating ten different feeds in each of the two polarizations at three different (spot) frequencies each through the 3.7 to 4.2 GHz band, you spend a great deal of time setting up the range and the measurement and recording equipment for each test. We first ran all of the feeds on the 'short' test range, a relatively close spaced system with the transmitter source on one side of an alleyway and the receiving and measurement point on the opposite side of the alleyway. There we did the following with all of the feeds:

- 1) Measured the 'response pattern' of the feed at 3.7, 3.95 and 4.2 GHz on one polarization (i.e. vertical); and then
- 2) Repeated the test on the same three frequencies using the

WHAT THE 'FEEDS' DID



SOLDIERS IN A ROW/ a selection of TVRO (home) system feeds line up waiting their turn to be range tested and evaluated at the **Microwave Specialty Corporation San Diego** test facility. In the background, a five meter reflector surface is being outfitted with a feed for test.

opposite polarization.

That's a total of six measurements per feed. The source transmitter is located some 20 feet above ground and it is connected to a broadband 'standard microwave horn' transmitting antenna. The signal is radiated through the air to a test stand also some 20 feet above ground. The test stand is equipped with a rotating turntable and the feed is clamped to that table. A motor drive on the table allows the operator to rotate the feed in a circle around its own center for 360 degrees. While the feed is rotating, the receiver connected to the feed is measuring the strength of the signal coming from the transmitter source. This received signal strength is drawn out on a moving piece of graph paper which has been calibrated in dBs or parts of dBs. So you end up with a 'pattern' for the feed which is calibrated two ways; in dBs of signal level, and, in degrees. The degree part tells you how 'wide' the feed's view is, just how well it 'sees' and therefore captures energy from the dish antenna it points at in a standard installation.

The signal plot on the graph paper, as explained in the October and November issues of **CSD**, is your permanent, written record of the performance of the (feed) antenna. You can study that written record and learn a great deal about the feed. That's what we intend to do here.

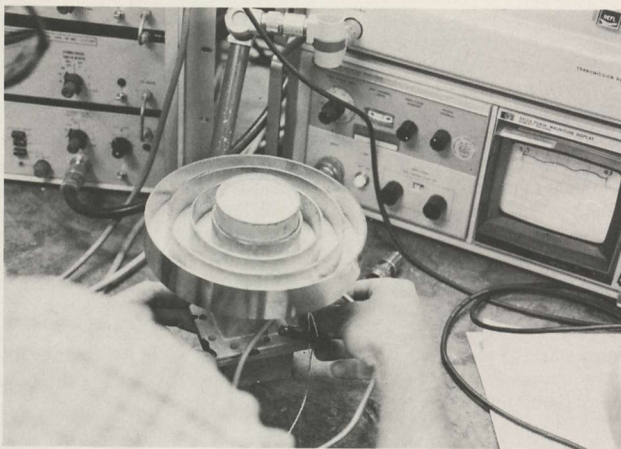
Having tested the feeds individually on the test range, for pattern and relative (but not calibrated) 'gain,' the next step was to analyze the results. With the guidance of skilled microwave antenna engineers at MSC, we tried to understand what the graphs were telling us. Most of the feeds fit the same 'mold' if indeed not the same pattern. But there were a couple which fell out of the 'mold' and we wanted to know why. So a second round of more selective testing began.

For example, pattern testing on the Omni-Spectra feed indicated the feed did not **appear to have** as much 'gain' as say a Chaparral Super Feed. True calibration of the range for absolute gain is a painful and long process; we had only two days of range time 'reserved' and we knew there were certain things we could not do and still be done in our allotted time frame. Yet the Omni-Spectra feed results begged further investigation. Did the feed **really** have less gain (i.e. lower pick up sensitivity)? We needed to find out.

In the second round of more selective testing we came off the range and went to the test bench. There you can create a situation using a microwave signal source which will allow you to test the 'match' of the feed; VSWR for the technical types. What is that all about and why is that important?

Any device that intercepts or carries microwave signals has a 'characteristic impedance.' That's a term which describes the complex 'resistance' of the circuit or device. Suffice to say that when you have two different gadgets that plug or attach together, and you are transferring microwave energy from one of the gadgets to another gadget (such as a feed output to an LNA input) the 'impedance' of the two must be as close to identical as possible, or, some of the energy in the upstream device will be lost when it transfers to the downstream device.

To put that into the feed and LNA world, if the feed is properly designed and captures 100 units of energy, but in 'sending' that energy from the feed's throat through the flange on the rear of the feed to the mating (input) flange on the LNA, there is an 'impedance mis-match,' not all 100 units of microwave energy get into the LNA. If, for example, 80 of the units got into the LNA, we would have lost 20 units in the 'transition' or 'transmission' from the feed to the LNA. Not good.



OMNI-SPECTRA MATCH and loss test; checking the power that 'comes back' to analyze the feed's loss characteristics.

Using work bench signal generators and microwave 'bridge' devices connected to the appropriate microwave receiving equipment which is in turn connected to the appropriate chart printers, you can 'see' on paper just what the impedance function of the feed does to that transfer of energy. We did this, first with a Chaparral Super Feed since that seemed like a suitable reference, and then with several additional feeds (including the Omni-Spectra unit). Now we had a **second way** of looking at the performance of the feed, from a different direction as it were.

Finally, there would be the 'long range' testing; of the original ten feeds, three would be selected from the pile and individually installed on a 5 meter high quality parabolic dish antenna using the 7,700' range described in the October issue of **CSD**. Now we would be measuring the actual performance of the feeds in the real world (i.e. reflector plus feed) to determine how well the feeds functioned when they were put into an operating condition. And for these three feeds, we would have a 'third perspective' to study.

Setting aside test runs for 'range verification' (i.e. assuring

ourselves the equipment and range were operating properly), when we got finished we would have more than 80 separate paper graphs to evaluate from the short and long range tests, and another ten or so from the bench tests. It would be enough to fill a book! But, we should know enough about feeds at that point to give you the support guidance **you need** in making your own feed evaluations and purchase selections.

DIVIDED In Parts

Because of the tremendous amount of data collected, and the reams of material to analyze and digest, not all of this report can appear in a single issue of **CSD**. In fact, it will take three issues to properly report to you what we found and how we interpret the results. And, in the interest of fairness to all of the feed suppliers involved, we will withhold **direct comparison data** on the various feeds **until** the third and final part of this report-series.

The fact that we were in San Diego, making tests of feeds, may not have been widely known **before** we went to MSC, but within days of the testing it seemed like hundreds knew about it. It is sometimes difficult to keep such things 'quiet.' And, not all of the feeds did well in the tests. We have already mentioned one of the areas that bothered us, involving an Omni-Spectra feed. Just to be sure that nobody tries to jump the gun and determine without the facts that the Omni feed did poorly, let us restate that direct comparisons between feeds will await our third and final part in this series. Where we found 'inconsistent' results (i.e. **our tests** did not produce results which favorably compare with the original manufacturer's claims or data sheets for the products) we have subsequently gone back to the suppliers to ask their interpretation of our results. This is having the effect of extending the time frame involved with this study since scheduling secondary visits to



HOW DO I HOOK THIS thing up? Coop pondering 'detailed instructions' provided with feed being tested.

various feed production facilities so that we can discuss our results with the appropriate engineers first hand adds additional time to the process. It will all sort out in the end.

HISTORY Of Switched Feeds

Those who have been around the (home) TVRO industry for some period of time are aware that until the mid-summer of 1981, this industry had a quite unusual way of switching customer receivers from one polarization (such as vertical) to the other. We installed a small television antenna rotator device (such as the Alliance model U-100) at the feed point, connected to the junction of the tripod or quadpod legs, and we then installed the LNA plus the feed itself on that rotator's rotating tube or rod. When the customer wanted to switch from WTBS to ESPN, he turned a dial on his television antenna rotator and the motor on the feed rotated the feed and the LNA on its axis. Slow, noisy, subject to mechanical maintenance problems, and not very satisfactory. Still, it worked and some of the early receiver designs such as the original **'Washburn Receiver'** (now Earth Terminals) actually pro-

vided an optional switching system with the receiver so that the TV antenna rotator moved semi-automatically when the customer changed receiver channels.

At the first industry trade show held in Omaha, Nebraska, there appeared in the booths a pair of devices which would forever change the way feed systems would function. **Bob Luly** demonstrated a motionless 'ferrite' rotational system while **Antenna Technology Corporation** in Florida demonstrated a system which bore a striking resemblance to a later device brought out by Chaparral Communications. Luly went into production with his 'ferrite rotator' while ATC did not. It would be another six months or more before the Chaparral Polarotor would appear in the market and finally capture the feed market.

Making a microwave signal do strange things inside of a section of 'waveguide' (a feed is actually nothing more than a section of 'waveguide transmission line' open at one end to allow the signals to get in) is not, it turns out, all that 'new.' In fact, a fellow named Murphy back in 1952 made an application with the U.S. Patent Office for a device he called an '**Amplitude Modulator**' (for microwaves). In March of 1959, nearly seven years after filing that patent application, Murphy's device was granted a patent (U.S. Patent Number 2,880,399) and the first 'polarization switching' system to select polarized microwave signals within a waveguide was off and running.

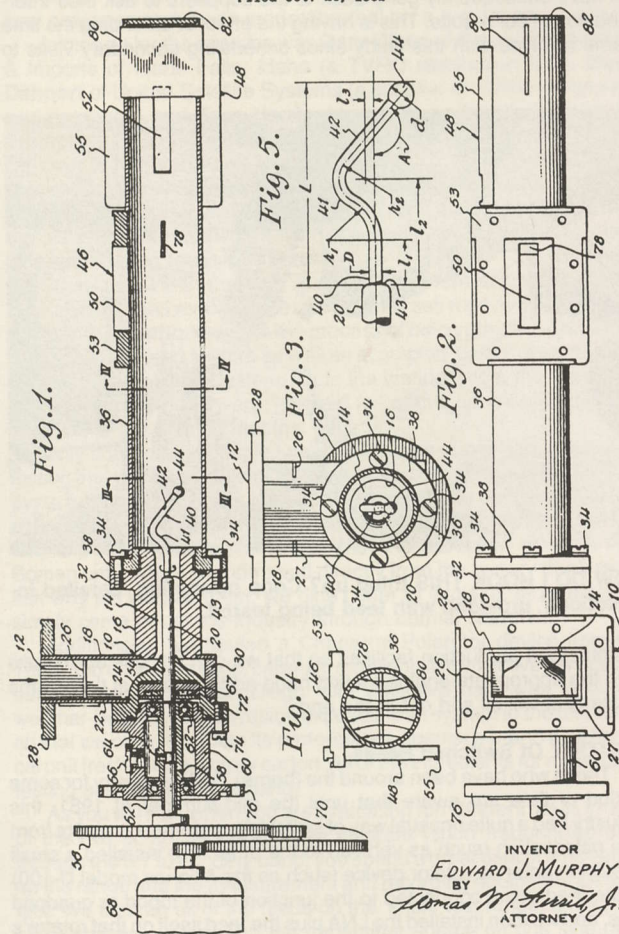
March 31, 1959

E. J. MURPHY

2,880,399

AMPLITUDE MODULATOR FOR MICROWAVES

Filed Oct. 20, 1952



MURPHY'S MODULATOR / patented in 1959, it created the first technology for 'switching' inside of an open waveguide system to create selectable polarization for microwave energy signals.

Murphy had never heard of Clarke orbit satellites when he created his device. He had no interest in separating ESPN from WTBS because they did not exist at the time. But he did lay the foundation for what would later become some 'prior art' technology. He was, simply said, 'ahead of his time' and the market for what he had in 1952(59) was hardly substantial.

More recently, in the period from the Omaha debut of polarization switching systems until the present, there has been some confusion concerning where the 'use rights' might lay for the basic system. Bob Luly's ferrite rotational system was someplace between new 'art' or technology, and, a refinement of an older technology using newly available materials. Patent rights, if any, did not seem to be an important consideration.

The mechanical rotation system exemplified by the Chaparral Polarotor was less complicated as 'high tech' art but possibly more ingenious because it broke new ground. There was a period of time where the claim to 'first creator' was in dispute. **Gene Augustin** of Antenna Technology Corporation **showed it first**, in Omaha to the (home) TVRO industry and possibly even earlier than that at a cable show in Texas in February of 1981. But it was Chaparral which brought out the first version to be (widely) marketed and it was Chaparral which received a patent on some aspects of the system this past November 8th. To the victor go the spoils and Chaparral was making it abundantly clear that any other suppliers of similar devices which Chaparral determined were violating the newly won Chaparral patent rights were going to be hearing from Chaparral attorneys. We'll revisit that subject, as it relates to a better dealer understanding of the marketplace, as this series moves ahead.

THE f/D Question

One of the basic considerations any system creator must think about is how you 'match' or 'mate' the feed unit to the reflector surface. The consideration here is that every dish has a specific, designed for and built-in focal length to distance (ratio). That means that the actual 'curve' of the dish is sculptured by the designer to follow some prescribed formula. You have heard the phrases 'deep dish' and 'shallow dish.' You have also heard that some dishes have an f/D of ".3" while others have an f/D of ".4". There is nothing special about those two numbers; a dish can be made to have an f/D of virtually any 'number' from .2 to .75 or so. What is important to you is that the feed you are selecting to use with the dish you have chosen must have a 'pattern' which coincides with the f/D of the dish. It would not be appropriate to use a feed designed to function (best) with a .3 f/D dish on a dish which has an f/D of .4. Just like the 'impedance match' problem discussed early, there is a 'loss' in the system when the two sub-parts of the antenna do not 'mate' to work together at maximum efficiency.

The designed-for f/D of a feed does not affect the short range (feed-stand-alone) testing procedure of a feed. All of the tests of the feeds alone are performed in the same manner. This is important to the understanding of the specific tests that follow.

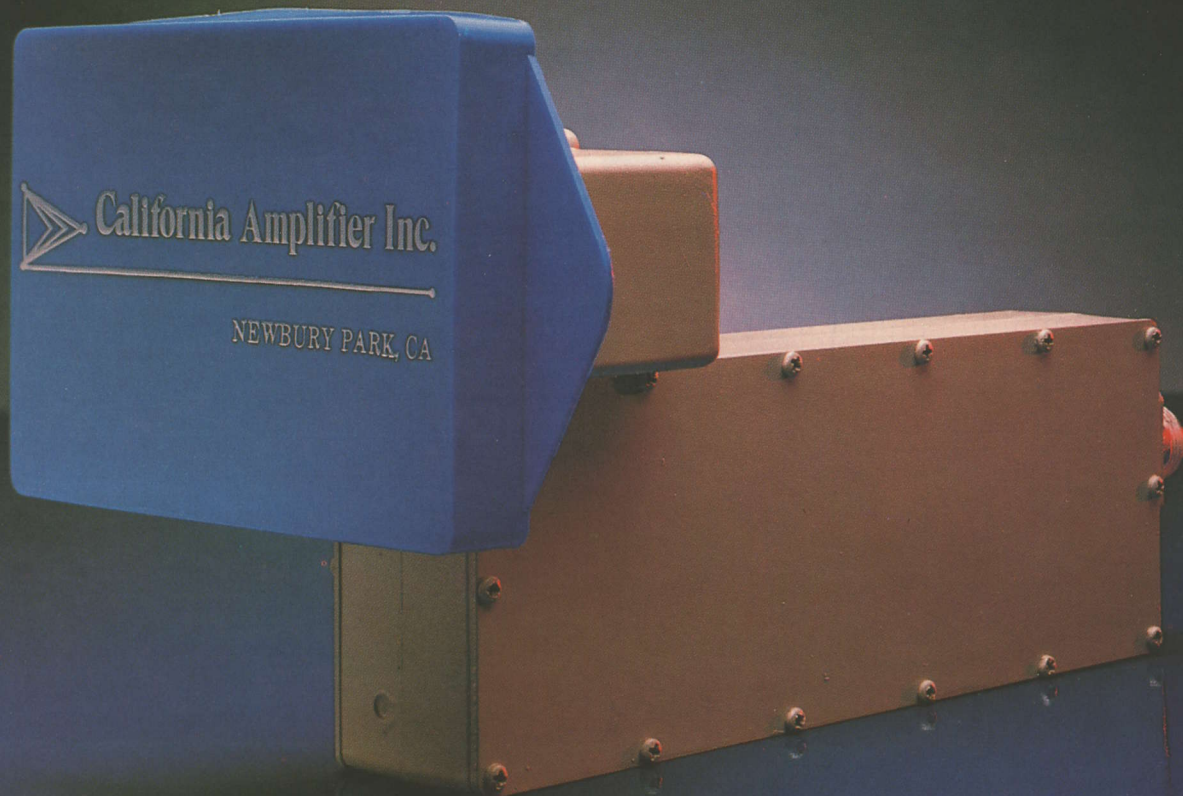
SUB-TEST — Plastic Covers

At the time of the feed tests, **Boman Industries** was in the process of evaluating a different type of plastic cover for their feeds. Most of the feeds now available offer a plastic cap which is installed in the open end of the 'waveguide' to keep unwanted moisture, animals and dust/dirt out of the feed itself. Different firms approach the 'weather cap' with different types of material, and with differing cap designs. We decided to see what the effects were when three different types of cap were installed on a Boman EFH-75 feed.

As the chart recorder **graph here shows**, first we took the cap totally off and measured the performance of the feed with no cap. That would be the **ideal** situation since **any cap of any type** will have **some** (adverse) effect on the performance of the feed system. It simply becomes a matter of designing the cap so that the adverse effects are minimized. Then we repeated the tests using a flat piece of mylar (plastic) created for the test by Tom Harrington, and followed this with a pair of additional tests using a dome shaped throat cover; the same cover which Boman was shipping with their feeds, and, with a newly created proto-type dome shaped cover which had a more pronounced 'dome' shape and thicker styrene plastic.

The charts, with explanation, pretty much tell the story. A flat piece of mylar, pressed into test service by Harrington, had the smallest

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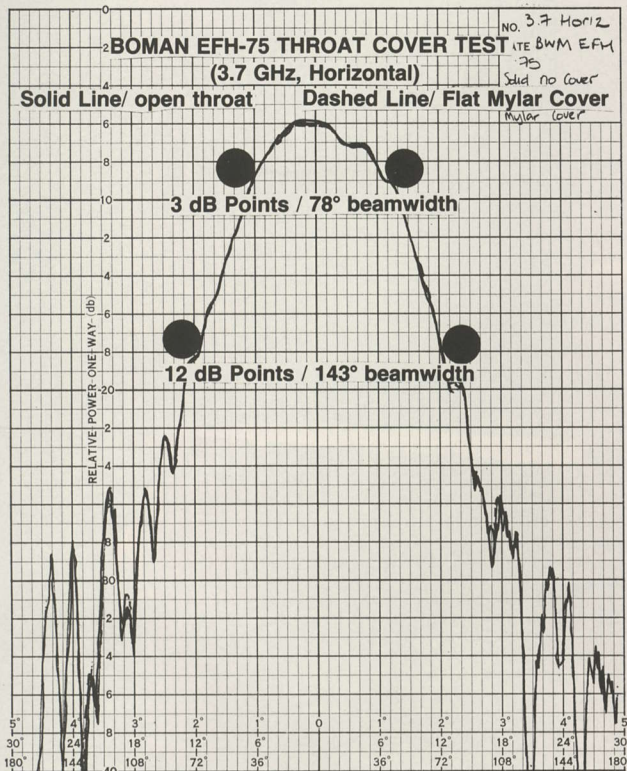
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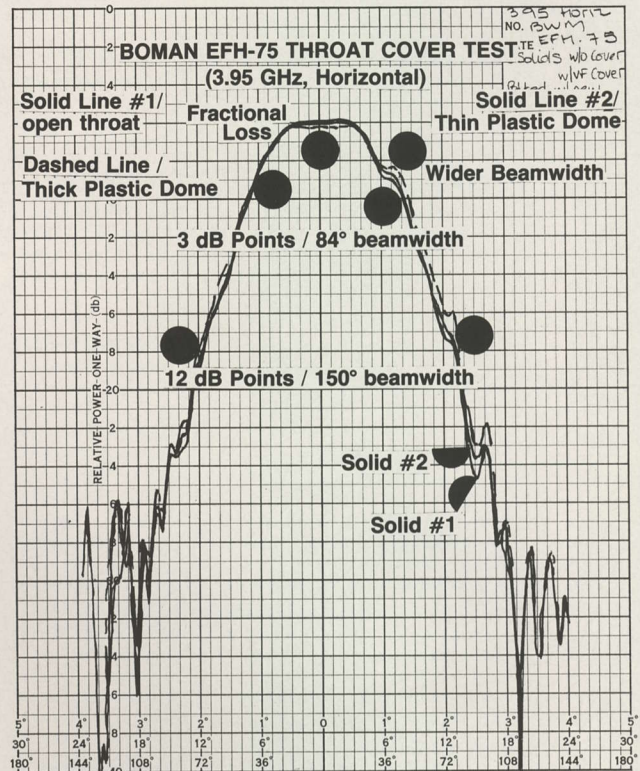
LOSS INTO THROAT caused by thin, flat plastic cover is virtually indistinguishable from open throat performance of feed system.

adverse impact on the microwave signals passing through the throat and into the waveguide. **Either** of the two dome shaped covers had a **measurable negative impact** on the performance; the worst-case here was the proto-type, more highly domed and thicker-material test dome. Some explanation as to what was happening.

Any cover over the throat of the feed waveguide will 'slow down' the through-passage of the microwave signals. Microwave signals travel at the speed of light **in air**, give or take a few percentage points. Microwave signals travel far more slowly in cable, for example; perhaps as much as 80% as fast in RG-213 cable as in air. If you could coil up enough very small cable, and not lose the signal totally because of signal attenuation, you could come close to actually stopping the microwave signal in its tracks!



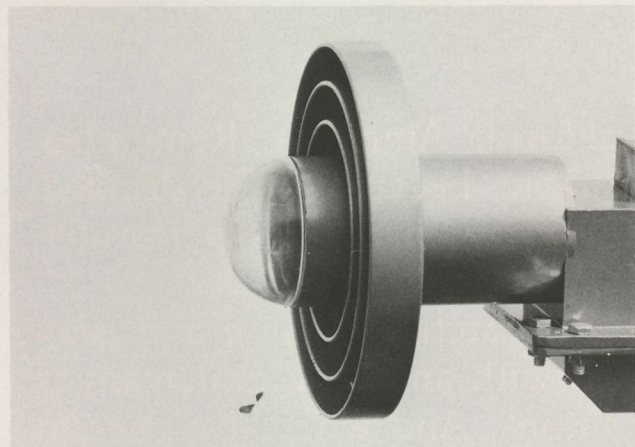
HARRINGTON CREATED FLAT SURFACE throat protector. Lowest losses of all.



WHILE CHANGES ARE small, there is a measurable reduction in feed efficiency with the thick styrene cover resulting in slightly increased beamwidth.

A piece of plastic, no matter what its shape, momentarily slows down the signal. The 'velocity of propagation' of the microwave signals traveling through the plastic is slower than the velocity of propagation through the air. As long as all parts of the microwave signals entering the throat of the feed encounter the same plastic shape and thickness at the same time, they pass through with minimal disruption.

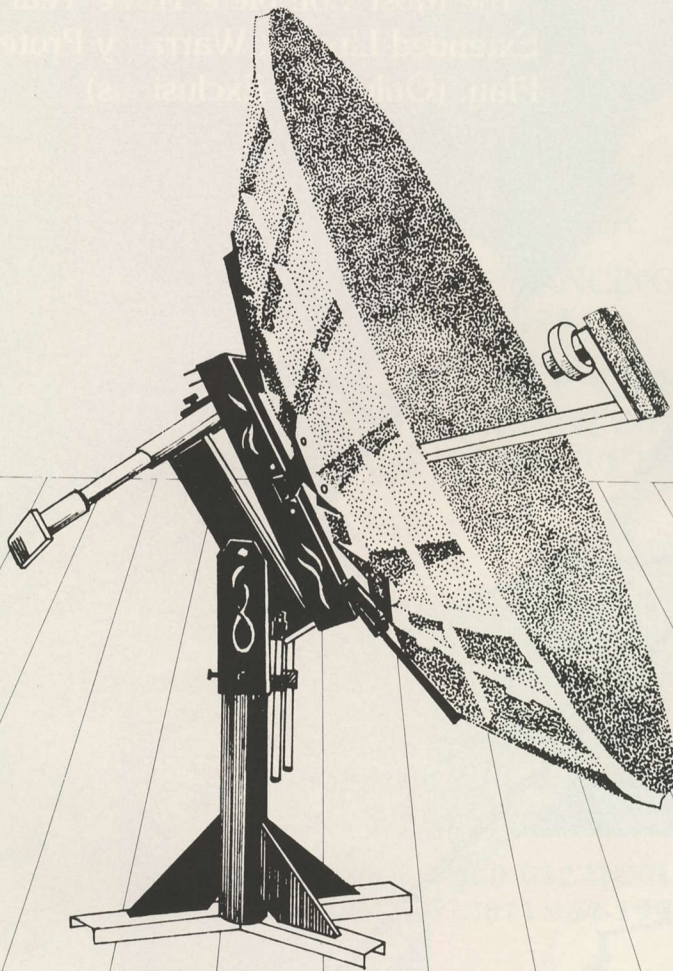
However, when the cover is dome shaped and some of the signal bouncing off the reflector surface hits the dome straight on from the front while other portions of signal come through the dome at a 'grazing angle' that appears tangent to the dome, there are 'minute



BOMAN EFH-75 FEED with thicker plastic throat cover. Objectionable losses.

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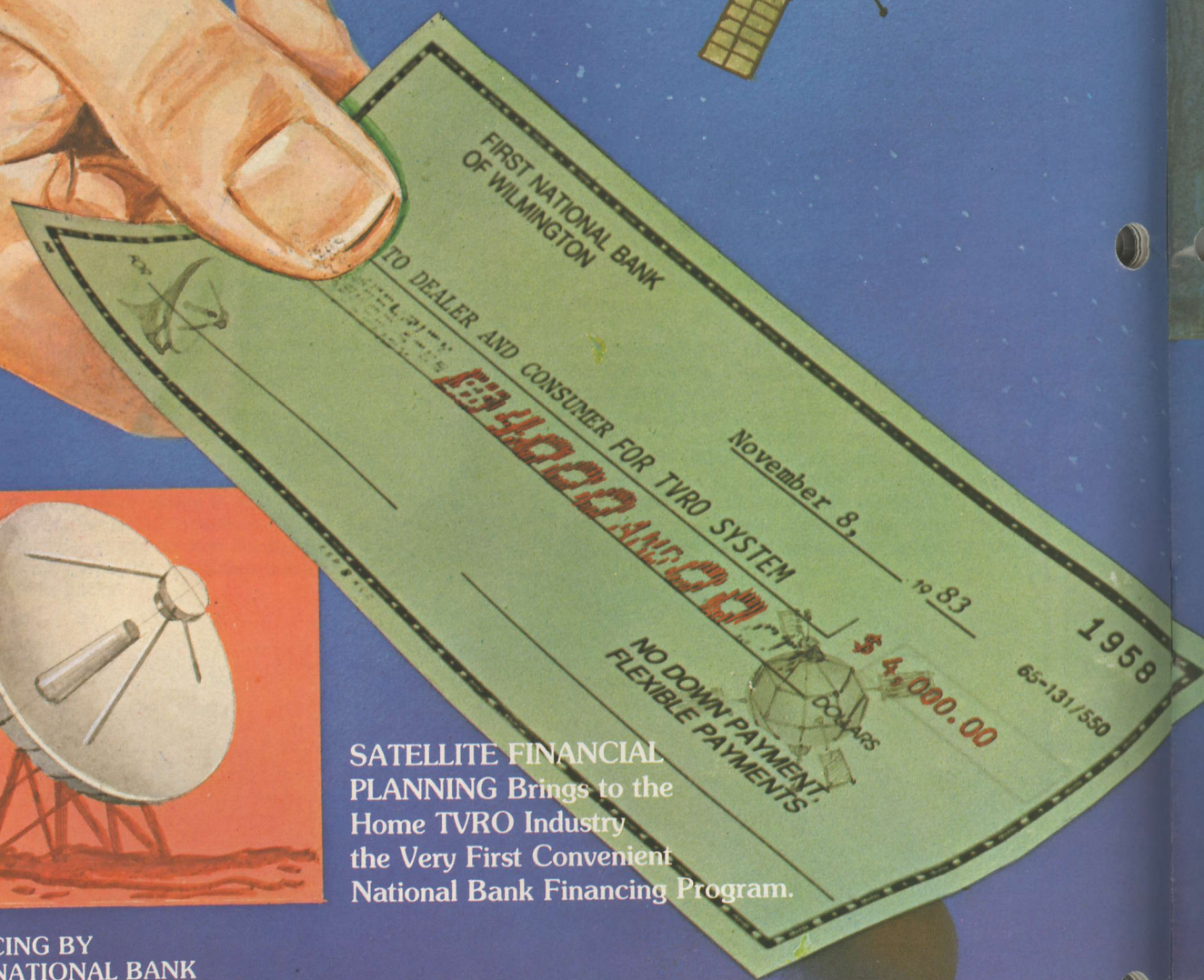
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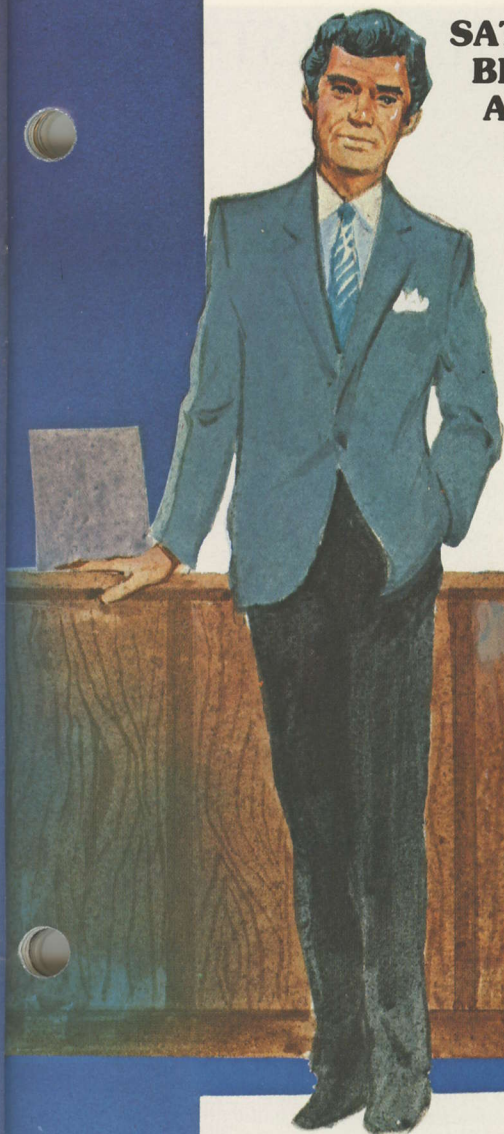
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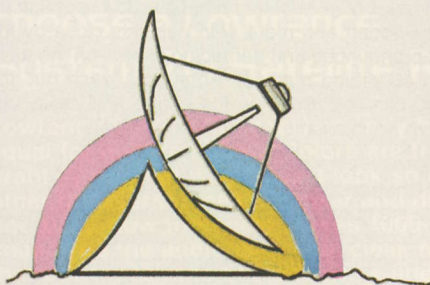
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FEEDS/ Continued from page 12

time differences' involved. The straight-through signals, bouncing from the central area of the dish, cross through the plastic dome at a 90 degree or nearly right angle to the plastic. Clean and straight through. The signals coming to the feed from the side of the dish 'graze' through the curving dome at an angle, passing through two or three times as much plastic as those signals that come from the front. **By passing through more plastic**, they are 'slowed in flight' for a longer period of time. And that affects the 'phase' or pattern of the feed. Adversely.

Bottom line? Nice dome shaped covers **look** nice. They have a space age look all their own. They may even fasten on quicker, better, and with fewer attachment problems. **But**, they cost you signal (although admittedly not much in most cases) and pattern control. We so advised Boman.

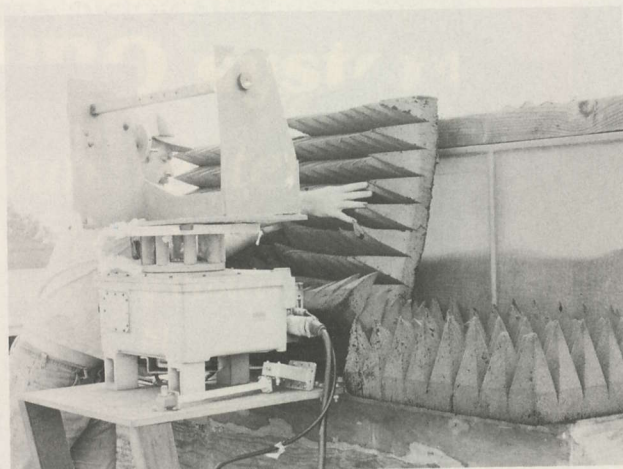
RANGE Bubbles

Prior to the first real tests you have to spend some period of time determining that the range is clean; a subject covered in some detail in the October report. There are ways to test feeds, using a special 'chamber' designed just for feed testing, which are followed by many firms. Such an 'anachoeic chamber' is commonly employed for the super-critical transmitting feed antennas used on board the satellites, for example.

Microwave signals bounce off of everything in sight. Metal objects are bad news and even wooden structures will reflect microwave signals. We could open and close the wooden door on the equipment shed housing the receiver and measurement equipment and see a change in some portion of the feed's performance pattern. This is not unusual nor does it signify that the range is unacceptable. It is simply



IT MIGHT GET WET. Tom Harrington (left) and USS's Doug Dehnert ponder what could happen if moisture or bugs found their way into the feed throat on this popular feed.



NOT CRUEL and unusual punishment. Jimmy Yates places 'microwave absorber' material around turntable on feed antenna test range to insure that reflections from building and adjacent structures do not infect the accuracy of the readings.

something which the range test engineer must be acquainted with, and be willing to 'wash out' where possible in the chart recorded results.

Our antenna chart plots are NOT totally free of such 'range bubbles.' You identify where these 'bubbles' are located by testing several different feeds and then noting where the bubbles appear. If the bubbles appear on all of the feeds tested, you know the 'range' itself is causing the bubbles. If they appear in the same spot only on one or two feeds, you know the feed itself is at fault (or, somebody forgot to leave the door open or closed on the shed!).

As the photo here shows, one of the ways you attempt to control reflections is to build a bed of 'microwave absorbing material' around the test stand. Microwave signals that strike this funny mid-evil formed material stops dead and is 'absorbed.' That keeps the signals from bouncing off say the test shed behind the test stand, and reflecting back into the feed as the feed rotates around with the motor drive. To completely eliminate **all** of the bubbles in a range such as we were using would require a 'football field' covering amount of microwave absorber and a crew of people to move a piece about at a time to totally 'clean' the range of all bubbles. What you do in a practical world is identify those wooden and metal (etc.) objects close by that are having the most pronounced and damaging impact on the tests, and cover them with absorbing material. Then you 'wash out' the rest knowing that you can spot them on the charts and easily discount them if they prove troublesome in the chart analysis.

WEATHERING/ Chaparral Polarotor

We first raised the question of feed weathering in serious context in our **April 1983** issue of **CSD**. We had observed and readers had reported a considerable cosmetic degradation of the aluminum Chaparral Super Feed and Polarotor 'scalar rings' with time. In our island test and system facility in the Caribbean, the apparent cause of the cosmetic degradation was obvious; high salt content in the air resulting in oxidation of the bare aluminum finish. Similar tests with Boman feeds, protected with an epoxy finish, indicated no cosmetic degradation with time. Our concern was less with the change in **appearance** than with what we perceived might also be a **change in performance**. The oxidation was not limited to the scalar structure of the feed but also appeared inside of the feed 'throat' proper. Since the microwave energy travels routinely down the inner walls of the throat, it was possible in our mind that in time the performance of the feed might degrade as a result.

Now there is no 'perfect' way to judge the performance of the feed "before" and after weathering. Ideally, you would first test the feed on the range and then take that feed into the environment and let it oxidize. Then you would bring it back and re-check it. We did not do this since access to the range has been a recent event. So we did the

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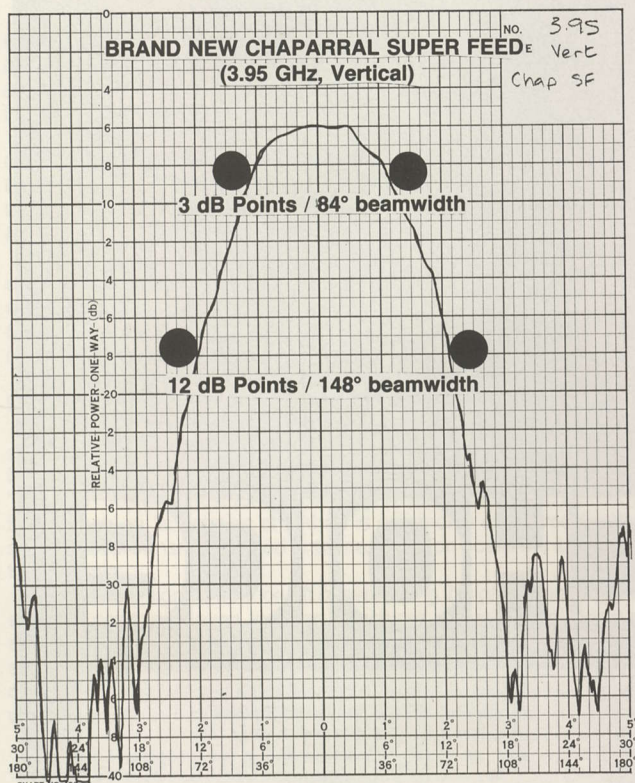
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BROAD NOSED pattern of Super Feed is typical of loading effects caused by Scalar rings.

next best thing; we compared a brand new Chaparral product with the older, weathered feed. We expected to find minute differences in feed performance since even two, identical, brand new feeds would exhibit those types of differences. What we were looking for was dramatic difference between the two feeds.

Publication of all six graphs for both feeds, here, would be a pointless mis-use of the available space. Two are presented, one that is representative of both feeds as tested at MSC.

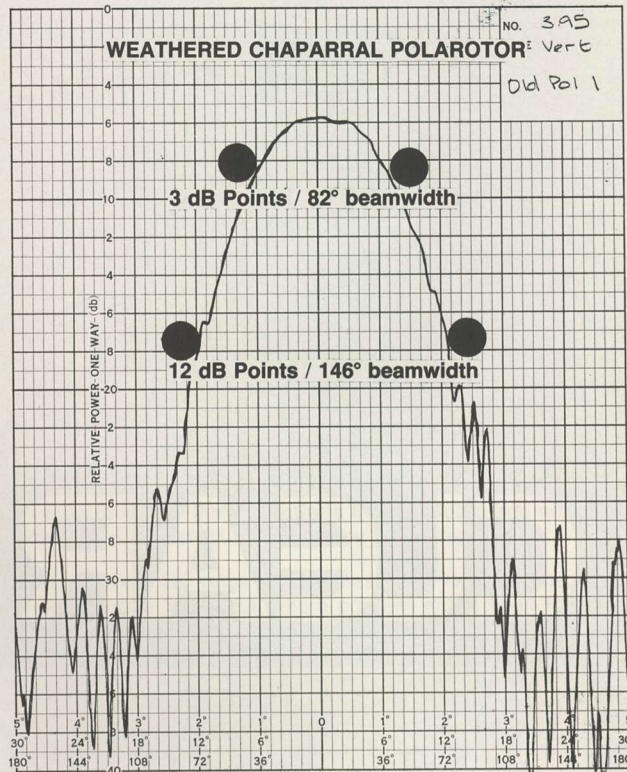
What we found is this. The patterns are not identical. In comparing the six sets of patterns (two for each frequency, 3.7, 3.95 and 4.2 GHz) for the pair of antennas, we found no consistent pattern deviations. Individual 3.95 GHz patterns from the two antennas are not identical; but there are no overt differences. This becomes especially true when you average or 'integrate' all six patterns for each of the two antennas and prepare a master 'composite' pattern for each of the two antennas.

This leads us to the conclusion that while six to 12 months of hard weathering and surface oxidation may look ugly, there is not any proof here that the performance suffers. Perhaps, in a longer test period, there would be degradation of the feed's performance. But we found none in our comparison tests and as noted, since we initially raised the issue in print in the April CSD, we wanted to clear that up here.

THE Scalar Feed

The primary purpose of the scalar rings is to equalize the 'pattern' or response of the open-mouth waveguide 'throat' over both planes of signal activity. The 'original' feed was simply an open-mouthed piece of waveguide. This was followed by a 'flared horn' which opened up the waveguide throat by giving it a bigger 'mouth' to capture the signals. Finally, along came the scalar 'loading plate,' a circular shaped attachment that fit over the waveguide throat surrounding it at the throat opening with concentric circles of metal (or metalized material) attached to a flat plate.

Early Chaparral Super Feed units manufactured the basic throat/waveguide plus mounting flange in **one** casting operation, and then



DECREASE IN PERFORMANCE (pattern) caused by weathering is not measurable.

manufactured the scalar concentric ring 'load' in a **separate** manufacturing operation. You mated the two together, sliding the scalar concentric ring(s) over the throat, tightening Allen 'set screws.' In that era, the installer could 'slide' the scalar ring up and down the throat and observe the impact of the ring on the throat. You were able to test the basic throat/flange alone, and then check the combination with the scalar at various in and out adjustment points. Chaparral soon made the full feed with a single casting and that eliminated the possibility that you might mis-locate the ring's location by fooling around with the adjustment and getting it in the wrong spot.

One of the feeds tested still followed this approach, separating the basic throat system from the scalar 'loading ring.' Naturally we wanted to see what might happen if we played with that adjustment. Tom Harrington was made responsible for this 'sub-test' within the testing program and this is what he found.

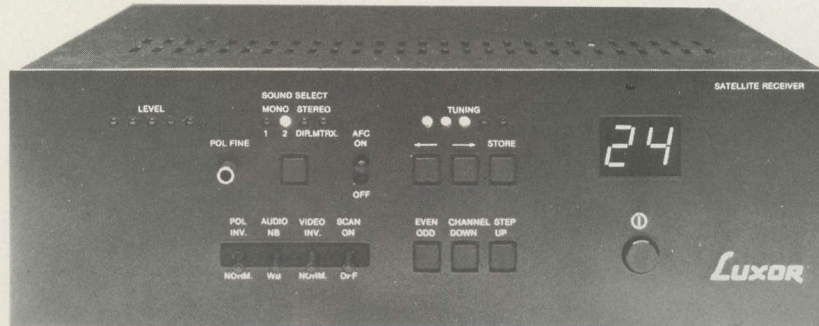
The feed in question is the **Polatron III** unit. Note in the photograph of the unit that we have a 'two ring' scalar loading system snugly fitting onto the waveguide throat. A (white colored) weather protection plastic 'dome lid' covers the throat proper.

In the first chart selected we have the 3.7 GHz horizontal field displayed. The 3 dB (one half power) points on the feed's response curve are marked on the chart. The same measurement in the same horizontal ('E' plane) field is also shown for 4.2 GHz. **Notice that the tip or nose of the pattern does change** between the low (frequency) end of the band and the high frequency end. This is not an unusual performance observation and most of the feeds tested displayed a similar frequency effect. This simply means that there is more of the energy coming from the **outer edges** of the dish getting into the field **on the higher channels** than at the lower channels. The difference between transponder/channel 1 and 24 will, however, be in the under 1/10th dB region in most cases even though the visual display on the chart makes it seem far more dramatic than that.

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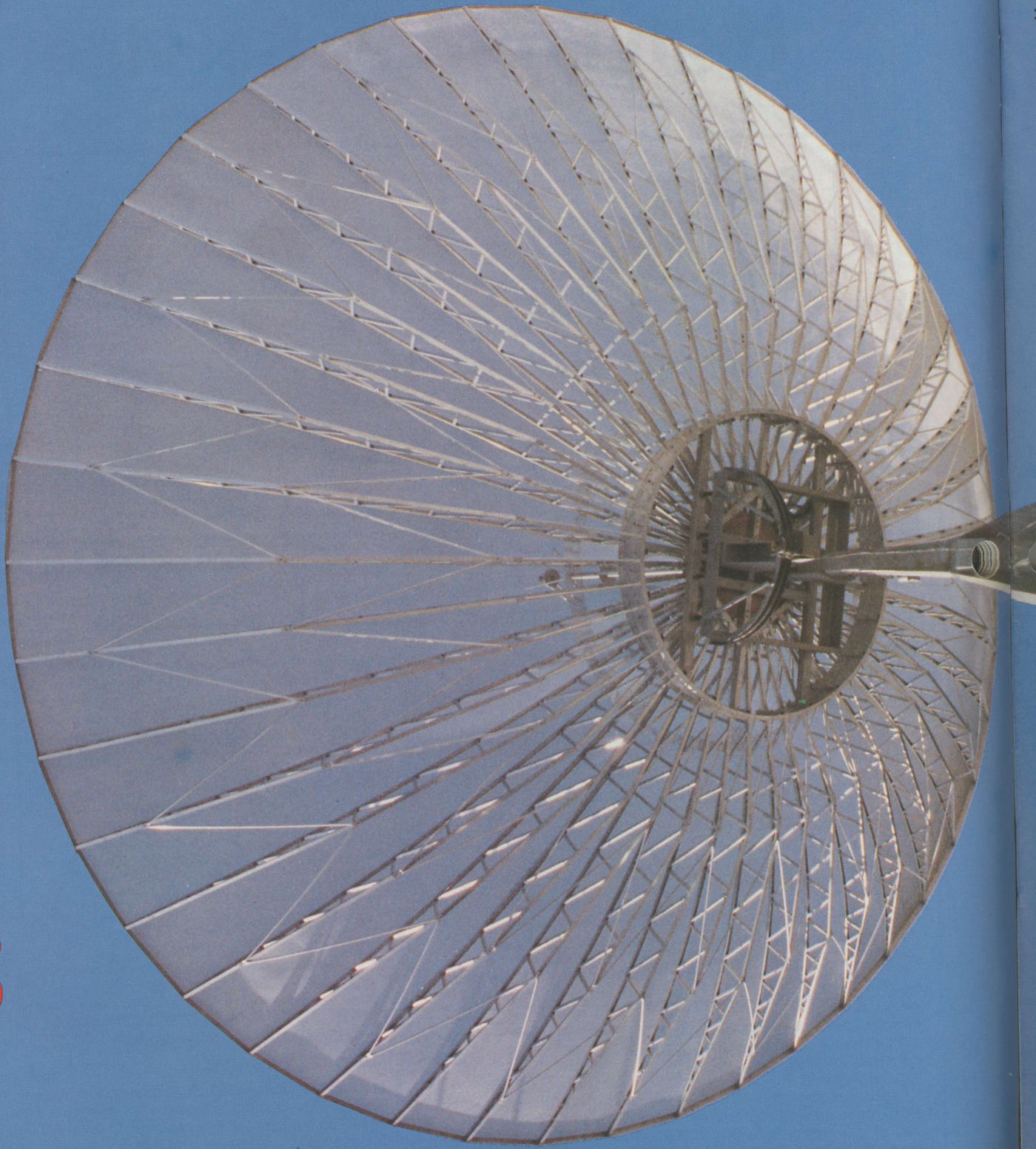
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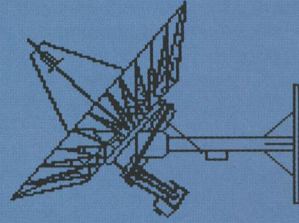
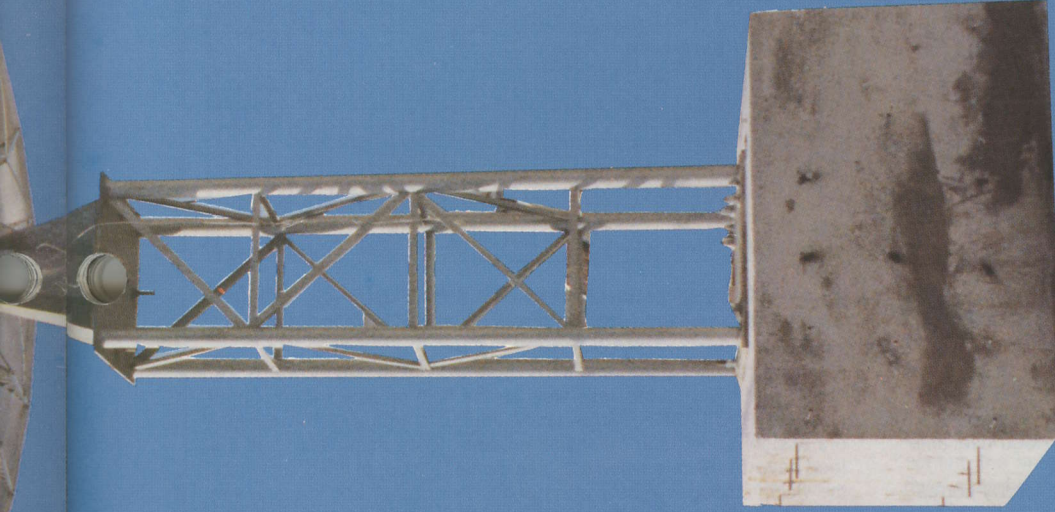


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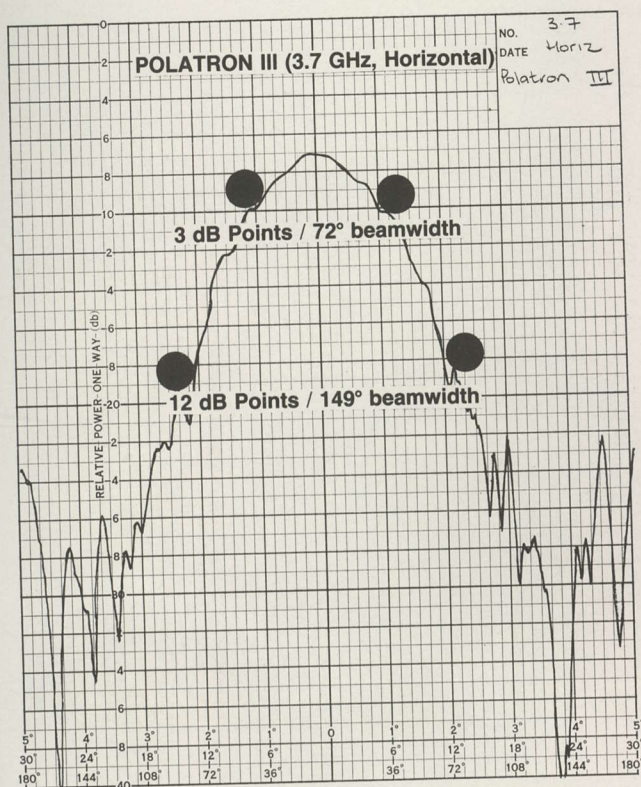
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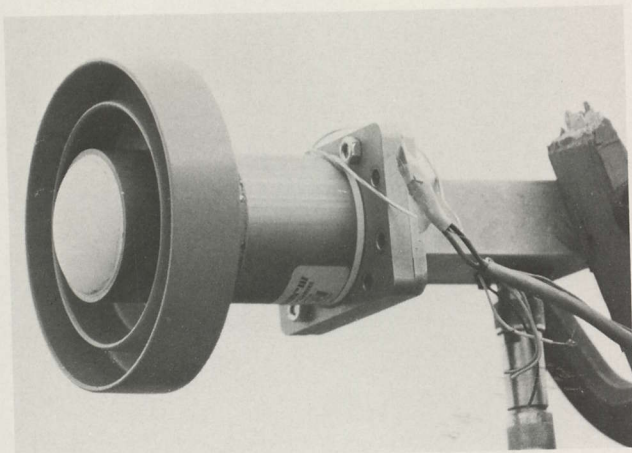
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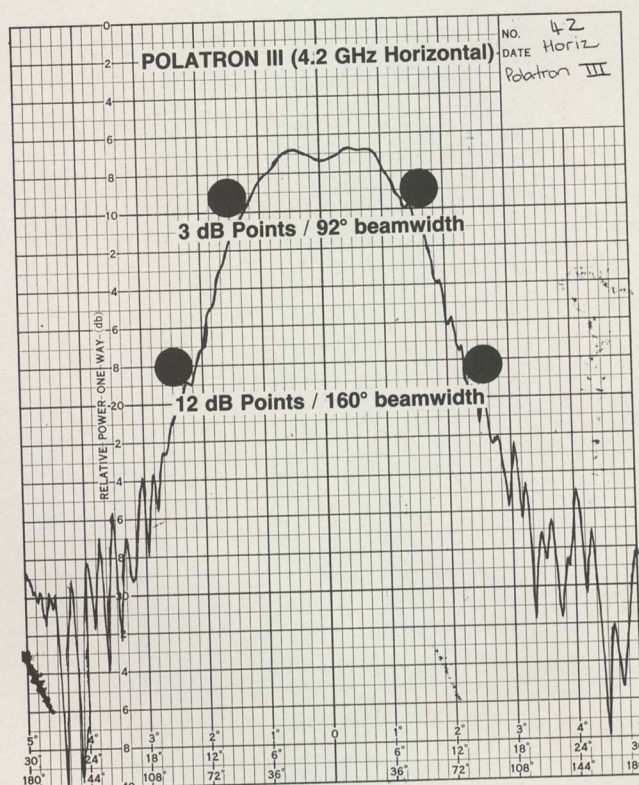
MORE ROUNDED NOSE pattern-center at 3.7 GHz (low end of 'band') typifies most of the feeds in use in (home) TVRO industry.

In the near-ideal situation the top portion of the response would be absolutely flat across the top portion (a straight line, left to right or right to left) out to the required 3 dB 'beamwidth.' Then the display would fall down the chart rapidly. There is no such 'idealized' feed available today.

The straight-across wide portion at the top would ideally correspond in degrees of feed 'vision' with the f/D of the dish. Let's say that we had a dish that required your feed to 'see' 130 degrees of total dish surface (left to right or edge to edge) **before** the feed would be looking **around the edge of the dish at the ground below**. Ideally, the feed would 'see' over a 'vision width' of 130 degrees and then it would abruptly not see anything beyond that point. In other words, the feed would 'see' just the dish surface alone but it would be 'blind' to the ground or sky around the perimeter of the dish surface.



POLATRON FEED with scalar ring in place.



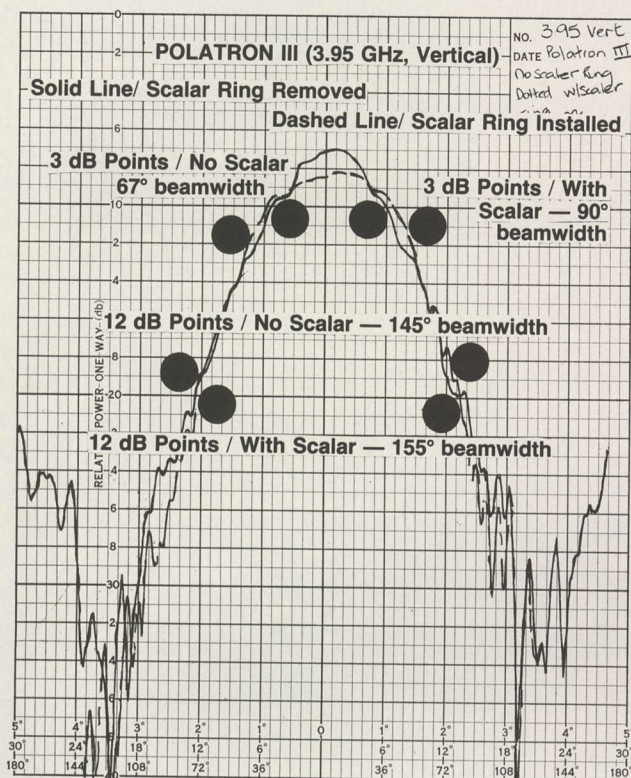
FLATTER NOSE pattern-center at 4.2 GHz (high end of 'band') typifies most of the feeds in use in (home) TVRO industry.

In the real world the feed sees best 'straight ahead,' towards the center and then it sees 'less well' as the field of view widens (in all directions; the full 360 degree circle). Various antenna system designers assign numbers to the vision process. They might wish that the feed have 10 dB less vision (i.e. less signal pick up) at the point where the vision crosses over the edge of the dish proper and starts to see the ground below. Or, they might assign a different number to that cross over point; such as 12 or 15 or 20 dB. What they are trying to balance here is the signal pick up from the dish's surface with the noise pick up from the ground that lays beyond the edges of the dish. Remember that the ground is a source of noise and if our feed 'over illuminates' the dish, and sees 'too well' beyond the dish edges or perimeter, the antenna system picks up an abundance of noise which in turn degrades the quality of our reception.

The scalar loading ring is supposed to adjust the field of vision so that the top portion or idealized flat portion spreads out, before the downward slip towards the bottom of the chart. The Polatron III scalar loading ring, since it detached on our unit, could be removed and we could observe and measure the effects of the loading ring.

This is shown in the chart here that has a dual 'trace' on it; operating at mid-band (3.95 GHz) and in the vertically polarized ('H' field) wave form, we could see what happened when the feed was run 'stock' (dashed line) and with the scalar ring removed (solid line). A few comments about what you are studying here.

Whenever there is an antenna being measured, you have a certain, specified, and measurable total amount of signal energy present through the antenna (i.e. appearing at the 'output' of the antenna). The design of the (feed) antenna determines not so much **how much** energy you can receive but rather **where** that energy can come from. Remember that a dipole antenna, a basic reference type of antenna, receives equally well from all directions except two; those being off the 'ends' of the dipole. A piece of waveguide, open at the end in the now familiar 'throat configuration,' can collect energy from its open-front direction only. However, the 'field of view' or vision of that throat is

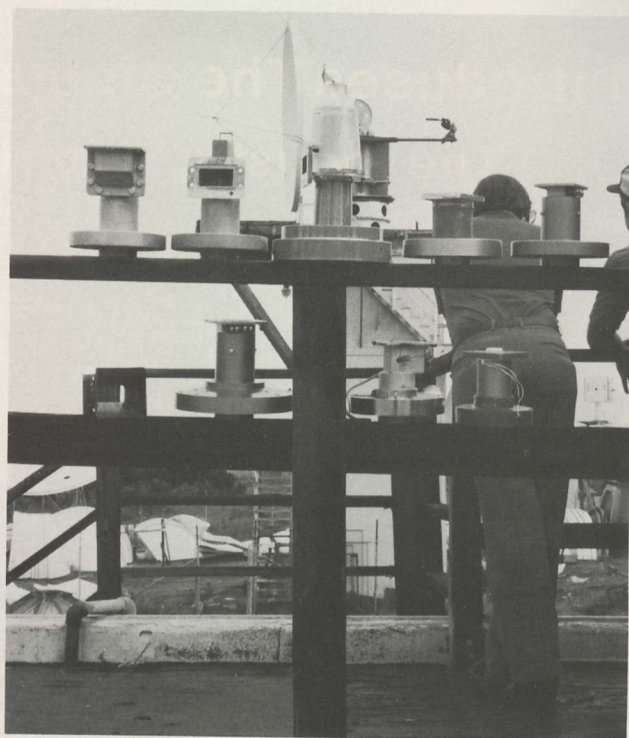
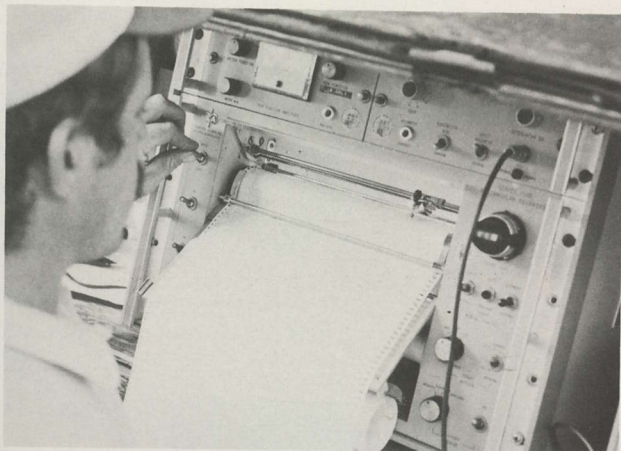


SCALAR RING (dashed line) and no ring (solid line) shows impact of 'loading' throat with scalar plate. Note text for comments about properly integrating the pattern for one-on-one comparisons and changes in 3 and 12 dB (down) beamwidths.

greatest when the 'flow of energy' is straight into the throat rather than coming to the throat from a 'side angle' (such as we have coming from the outer edges of the dish).

The scalar loading ring, properly designed and properly installed, re-focuses the vision of the throat so that it is 'spread' away from the straight-ahead forward direction and more to the sides. **We are not creating any new 'energy-capturing-capacity' with the scalar loading ring;** we are merely **re-distributing where that energy can come** from by moving some of the open throat's 'focusing powers' over to the edges of the dish.

Now look carefully at the Polatron III feed measurement showing the **with**, and, **without** scalar ring presence. The without (solid line) display is higher up the chart, indicating concentrated focusing power. But it is focused squarely in the **middle** of the chart, or at the **center** of



the dish. The dashed line, on the other hand, is a broader display; a straighter line across the top indicating that the focusing view has been 'squashed down' straight ahead in favor of **shifting** some of that focusing energy to the sides or edges of the dish.

There are two approaches to making a chart such as this. You can do your first 'cut,' say with the ring removed (solid line) and then come back without touching any of the chart recorder/receiver sensitivity controls and do it again. When you do it this way (we did), you see quite clearly that the second cut energy recording (dashed line representing the antenna with the scalar loading ring) is indeed lower in level straight ahead but broader or wider to the edges.

The other approach is to make your first cut recording and then when making the second cut re-adjust the sensitivity controls of the receiver/recording system so that both cuts have the same 'amplitude' (strength on the paper). This would have placed the dashed line highest point **exactly equal** towards the top of the graph paper with the highest point previously recorded with the solid line. Technically, this is known as 'integrating the patterns' or making them exactly comparable in amplitude.

The point here is that you don't really have **MORE** energy with the non-scalar-loaded horn; you simply have that energy concentrating at different points in the feed antenna's pattern. The **TOTAL** amount of energy captured does not **HAVE** to change; but where it appears on the chart (and therefore where the feed antenna 'sees' best) does change with the addition of the scalar loading device.

We did one additional test with the Polatron III ring. Since we had the feed 'apart' Harrington turned the scalar loading ring around, making a 'flat plate' face towards the signal source. The back or away-from portion of the scalar ring is more or less perfectly flat. By facing it towards the signal source we were able to measure the effects of having a non-sculptured loading device (flat rather than 'ringed'). The results (not shown in graph form here) were virtually identical to the feed with no scalar loading ring at all. In other words, the contours of the scalar loading ring do account for something and the open throat feed cannot be 'loaded' for a 'broader pattern' simply by shoving a chunk of metal down over the throat.

NEXT Month . . .

. . . we will look at the test measurement results with the Super Feed, the Boman series feeds and explore how the f/D of the dish impacts upon the design of the feed proper.



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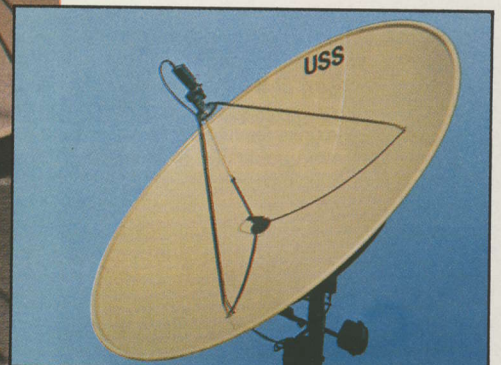
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COMPARISON TESTING

ADM's NEW 11 FOOTER

ROUND Two

When this industry was just beginning, only four short years ago, a young man in Missouri decided he would no longer settle for a single channel of television. Located as he was in a rural region where cable was not available, he began his quest for additional entertainment and information by contacting a young satellite receiver manufacturer in Virginia. And so **Jamie Gowen** of **ADM** was introduced to the home TVRO world by budding entrepreneur **Andy Hatfield** of **AVCOM**. The two in concert would 'pioneer' the first fully packaged TVRO systems in the TVRO industry with Gowen providing the dish antennas.

As the January (1983) issue of **CSD** revealed, in the interim **ADM (Antenna Development and Manufacturing Co.)** became the largest supplier of parabolic dish antennas for the 4 GHz world . . . in the world. But time and space have a way of standing still for no man and during 1983 an interesting thing happened; ADM's number-one position in the antenna world was challenged on several fronts. First there came the smaller 6 to 8 foot antennas and with their market entrance arrived an entirely new concept in mass production of antennas. Whole antennas were spun and stamped in minutes. With the process entire reflector assemblies could move from the raw metal stock level to completely installable dish level in an hour or less. And, because the reflectors were typically one piece, they could be shipped with greater ease, assembled with greater ease, and installed with greater ease than their multi-petal companions in the 8-10 foot and up class. ADM at the time was producing antennas from 11 feet to 20 feet and like the original ADM multi-segment 'petal' dishes, the then-current versions required piece by piece construction techniques. **That hurt ADM.**

And at about the same time along came another competitive threat; the high-accuracy, high-quality screen mesh dish antennas from firms such as Paradigm. While the smaller 6 to 8 foot size stamped and spun dishes offered simplistic installation and reduced costs, the high-grade screen mesh antennas offered equal-to or better-than performance when directly compared to the standard 11 foot ADM multi-petal antenna. And so there was further erosion of the ADM domination of the 'small antenna' marketplace.

All of this happened during a year when the marketplace was exploding by a factor of 3 to 5. The reduced influence of the ADM antenna line was not immediately apparent, even to ADM. The total number of antenna units leaving the factory varied only slightly and in many instances even continued to increase. However, the **rate of increase** was far from keeping up with the growth of the market itself. In short, ADM's small-antenna series virtually stopped growing in sales at a time when the market itself was exploding by as much as 500%. Clearly something needed to be done to turn this situation around.

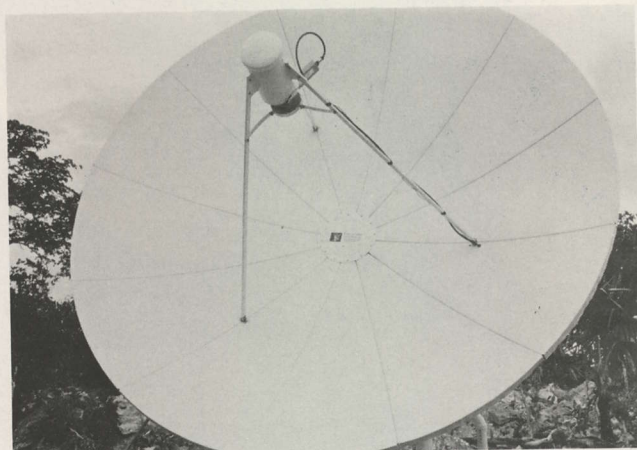
ADM's Jamie Gowen found himself in a quandry. Sales were 'never better' and in particular the firm's large antenna line (16 and 20 foot models) was taking off at a dizzying pace. The growth of the

bigger versions caused the rapid expansion in production capacity and manufacturing space the firm grew into during 1983. And at the local or regional level, where ADM maintains a tight control on retail sales of completely packaged systems in a 100 mile radius of Poplar Bluff, small antenna system sales exploded rapidly during 1983. Still, ADM knew just from shipping and sales records that the share of (national) market was falling apart; perhaps rapidly.

WHICH Way To Go?

Not convinced that 6 to 8 foot antennas were a long-term 'smart bet,' with the industry facing closer satellite spacings and possible consumer feedback as the newer satellites lost some of their power and reach (see **CSD** for July 1983; page 8), ADM quickly dismissed the small-dish spun or stamped approach as a viable product alternative. With perhaps the largest antenna production facility for metal antennas in the world today available to them, those who are into 6 to 8 foot spun and stamped dishes can be glad that at least for now that alternative is not being pursued. Dismissing that choice, this left Gowen and crew facing the other threat; more efficient and therefore higher performance competition.

The original ADM 11 foot antenna was created out of metal petals. The petals are stamped and formed in a complex but efficient manufacturing process utilizing huge press and bend techniques. Connection of the individual metal petals is accomplished by locating bolt holes in each piece such that the holes of one petal align with the holes of the 'neighboring' petals. The entire system is supported above ground on a tracking polar mount 'tripod' (or post) which allows the installer to adjust the dish initially for the appropriate declination. Two



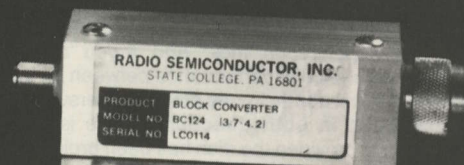
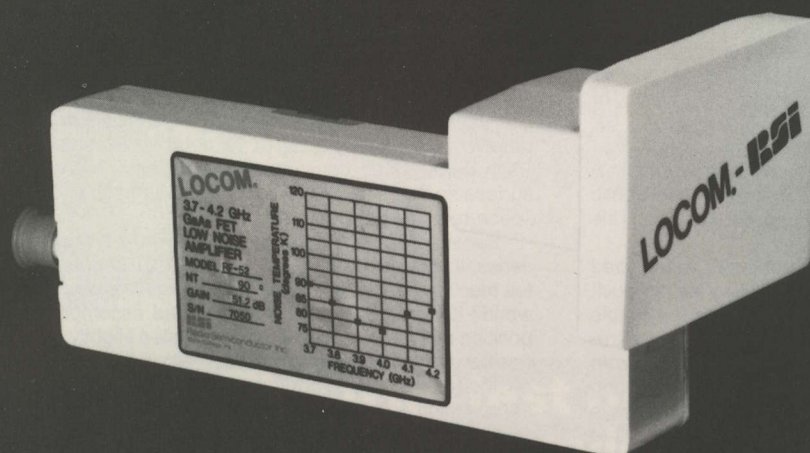
12 PETAL ADM 11 foot dish totally eliminates the 'gaps' found in older series antennas and provides two-way parabolic surface accuracy for maximized gain and performance.

*—ADM/ Antenna Development & Manufacturing, Inc., P.O. Box 1178, Poplar Bluff, Mo. 63901; 314/785-5988.

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areas in product design were identified where improvements could be made.

Number one: The manufacturing process had certain 'tolerances' assigned to the creation of the petals and the holes in each petal. Those tolerances could be improved upon. The result of these changes would be that the antenna would assemble in the field with 'less hassle,' and, the in-field performance would be improved.

Back in 1981 at the STTI Omaha show, nearly two dozen antennas were 'range tested' for performance. The ADM 11 footer had measured as the top performing antenna in its class (size class). That was a laurel which ADM wore proudly. However, in the intervening years others had found ways to improve the performance of their own competitive products. Paracclipse line antennas in particular were demonstrating performance which in the 11/12 foot size region was outstanding. This required a re-evaluation of the surface accuracy of the ADM 11 footer.

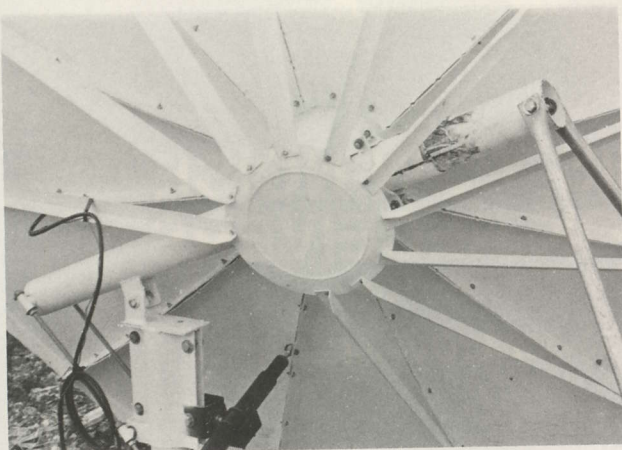
Number two: From day one, the ADM metal petals had been 'parabolic in one direction'; that is, they curved from the narrow center point to the broad antenna rim point along the parabolic curve. They did not curve (at all) in the opposite direction. This would be corrected with the new model(s).

Not being parabolic in 'both directions' was no sin; with limited exceptions, only a handful of metal antennas (including the big-buck versions in the totally commercial world) actually went to the trouble and expense of creating a 'tool' which would make each petal parabolic in all directions. Being parabolic in both directions cost extra large tooling dollars, and it greatly complicated the manufacturing process. Metal bends one way at a time with ease; it bends two ways at the same time only with considerable reluctance. And getting it to bend two ways at the same time in the same operation, and not having it 'spring board' back to some intermediate shape after being formed is no easy (nor dependable) 'trick.' And, if you 'run the numbers' to evaluate the difference in performance between an antenna or some set size which is **parabolic in one direction** versus the same antenna that is **parabolic in both directions**, there is only a small gain advantage 'lost,' provided the dish has been broken up into sufficient 'sections' or petals to spread the 'losses' around into small chunks.

With revised tooling and parabolic two-way petals ADM was back in the competitive antenna world with a product that already enjoyed an excellent reputation for performance from a company that consistently rated at the top for being honest and devoted to user satisfaction. And so to the Providenciales test range of CSD came a pair of new antennas that came out of the new 'design mold'; the 11 foot ADM and the 13 foot ADM. This report will deal with the installation and performance of the 11 foot version.

PUTTING It Together

We first assembled an ADM antenna early in 1980, after seeing



CENTER HUB assembly follows the time-proven ADM approach to making the antenna strong and stable under adverse weather and wind conditions.

the dish for the first time (along with most of the rest of the industry) at the second industry trade show held in Miami, Florida in February of that year. Our initial ADM 11 foot dish was pressed into service for reception from the Russian Molniya satellite series from the CSD facility in Oklahoma (see CSD for June and July 1980, and, November 1983 for a discussion of the Russian Molniya series). In the intervening years we have assembled more than a dozen ADM antenna products and it was in fact an ADM 11 footer which provided initial, first-time television to the Turks and Caicos islands in the late summer of 1980.

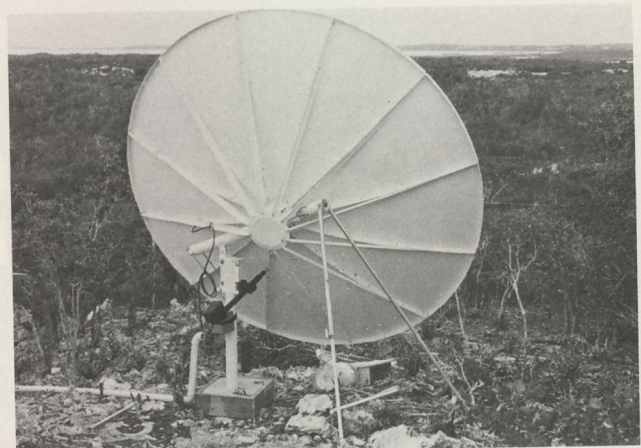
With that experience under our belts, we handed the 11 footer to a recently added WIV staff member and suggested that he assemble it. He had no prior antenna assembly experience and had only recently been exposed to the world of satellite TV. We sat back and watched him sort out the first-time assembly process.

The 11 foot dish has 12 petals. Each is **exactly** like all of the others and you start in the time honored ADM tradition by attaching the narrow, center area, portion of the petal to the center 'hub' assembly. Each petal added completes an additional 1/12th of the reflector surface so that as you approach the end of that exercise you have a space remaining for but one petal.

Because of the tooling accuracy with the **earlier** ADM 11 foot series, it **was possible** to end up with the last hole vacant and either too much or not enough space remaining. This was not the 'end of the world'; it merely meant that as you had assembled the petals into position they had individually been located slightly off of their desired positions and the cumulative error that went with being say 1/16th of an inch off of the proper position had added up to something approaching a 1/2 inch or so 'gap' or 'constriction,' which refused to mate with the last petal in hand. The solution to that problem had always been that you merely loosened some bolts around the full perimeter of the dish and 'jostled' the petals back and forth until they seated in the proper position. However, many people installing the antenna failed to do this in the **proper** manner and often the 11 foot surface was slightly skewed or even warped because of the ineptness of the installer. This sort of 'inaccuracy' ultimately would adversely affect the performance of the dish proper.

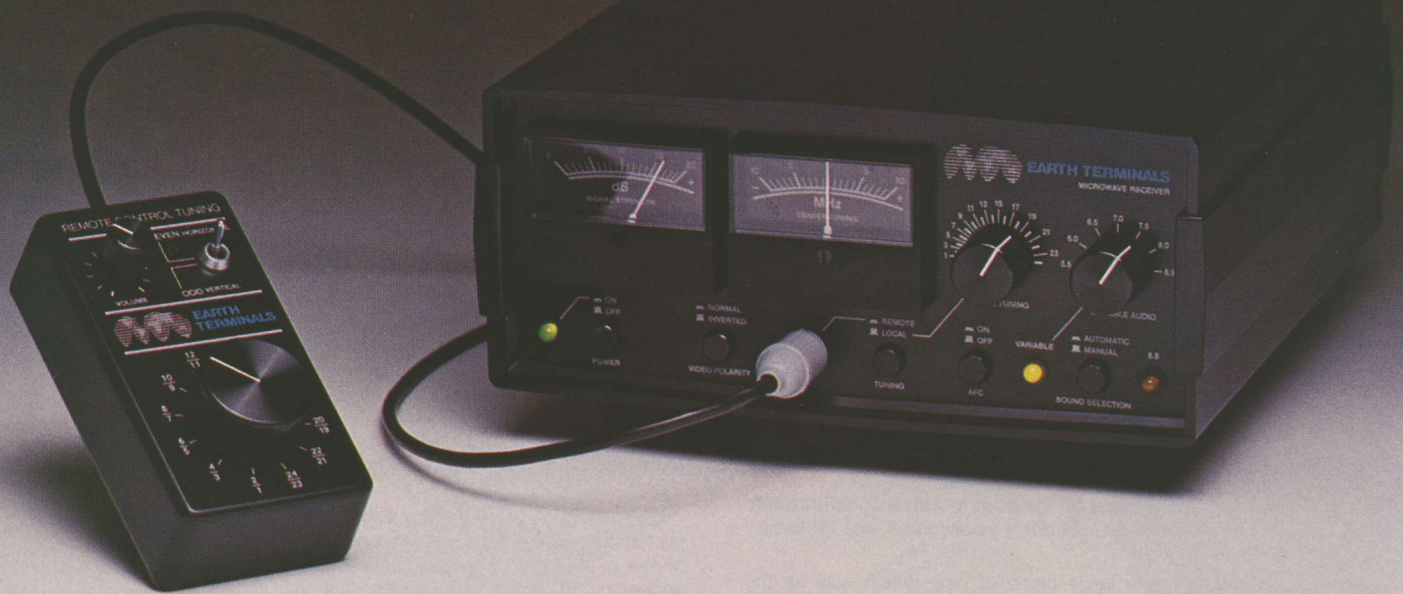
The new tooling eliminates that hassle and problem. First of all, the petals are individually far more accurately formed and the variations from petal to petal are virtually non-existent. Secondly, the tolerances of the in-place holes which provide petal to petal connecting points for the bolts that hold the petals together, and to the central hub, are much tighter. The net result of these two improvements is that the 12 petals go into place with great precision and as you come to the 12th and final petal the gap remaining accommodates that petal **precisely**.

ADM's antenna mounting system has been 'traditional' mechanically but 'unconventional' in form and substance since day one. The



NORTH END support struts offer an optional method of securing the dish on the post mount to insure that heavy winds don't force the dish to rotate around its own post-mount axis.

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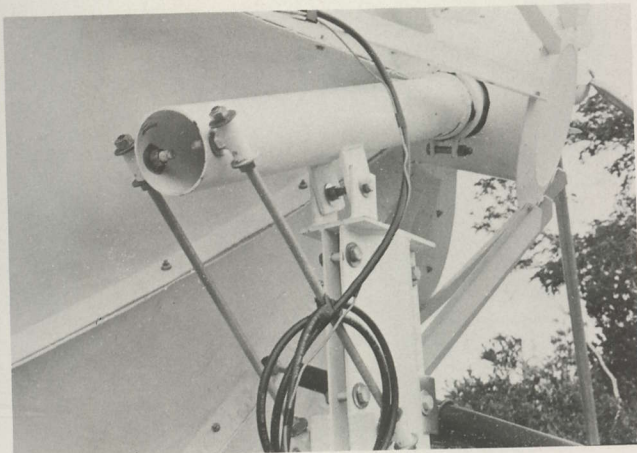
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dish always attaches to a large piece of pipe which acts as the declination-adjusted torque arm to swing the dish through the Clarke orbit belt arc. This large piece of pipe is in turn supported at the north end by a pair of pipe to ground supports, angled east and west to provide lateral stability for the dish. And at the south end of the pipe, the antenna is supported with a heavy pad-mounted set of feet which solidly attaches the entire structure to the ground.

While this system has been (and continues to be) mechanically sound, it has not always been the easiest system for an installer to perfect for proper Clarke orbit satellite tracking. Because there are several potential moving pieces of metal involved, a 'novice' in the installation business could spend several hours learning that the front feet on the pad have to move in concert with the rear support legs whenever a new adjustment is made in the north-south tracking; or, the dish will track over only a portion of the belt.

With improved dish structural accuracy and an opportunity to refine the mounting system, the present day ADM 11 foot user has a new alternative for mounting. ADM has introduced a 'post mount' which is useful for their recently introduced 9 foot dish, the 11 foot under discussion here, and given certain constraints, even their new 13 foot antenna. Our test model used this post mount.

As the photos here show, the post mount is not unlike several dozen other post mounts now available in the field. However, ADM has taken the extra precaution of offering the same north-end-of-dish support arms which are also an integral part of their (still available) traditional mount. This provides a 'tie-down' system to the otherwise off-center supported declination oriented large section of pipe which holds the dish on the Clarke orbit belt. All of the primary adjustments for dish tracking and elevation tweeking are built into the dish-to-pipe assembly. The north-end support arms are there to tie it all down, securely, **after** the antenna has been adjusted for best performance and tracking.

We found this gives the installer the best of several worlds; the ease of aligning found only with a pipe or post mount, and the stability of a more complex three or four point mount. It also reduces the complexity and cost of creating concrete-in-ground tie down points for the dish; one hole 'punched' for the pipe or post with a modest amount of concrete to stabilize the post (the exact amount of concrete will vary with installations but well under 1/3rd yard is likely per installation) and two more even more modest tie-down locations for the two 'stabilizer bars' at the north end of the antenna (**total, typically, of less than 1/2 yard of concrete**).

In the process of refining the dish reflector system plus the mounting system, ADM has also re-worked the feed support system and shroud which protects the feed. In our installation we used a Polarotor rotational system plus a 100 degree LNA which we mounted directly on the Polarotor feed **without using** the right angle waveguide adapter. You could 'bury' all of the feed parts and the LNA inside of the shroud if you wished. The LNA is adjusted for focus (this is a .4 f/D

dish) by sliding the innards of the assembly along some 'tracks' that form the feed mounting package inside of the shroud.

PERFORMANCE?

Obviously the final proof of the system is how well it works. Here is what we found.

The ADM 11 footer is in the same marketing world as say the Paracclipse 12 foot mesh antenna; an antenna that consistently has gotten high marks for performance when it has been properly assembled. We did extensive A/B testing between our test 11 foot ADM, an older ADM 13 footer, and the Paracclipse 12 footer.

Tracking first. The dish requires perhaps four man hours to assemble if you have a modest background in the field. A pro could shave an hour off of this, between 'box' and pictures. With the post mount and the adjustments provided, it is difficult not to have pictures within two minutes of electronics turn on. The adjustment of the east-west tracking and the declination (peak declination on a high bird, peaking east-west or azimuth tracking on a low bird) should fall in within five to ten minutes for even those who are after that last tenth of a dB of performance. If you play any longer than this, you are truly 'playing' just to be playing.

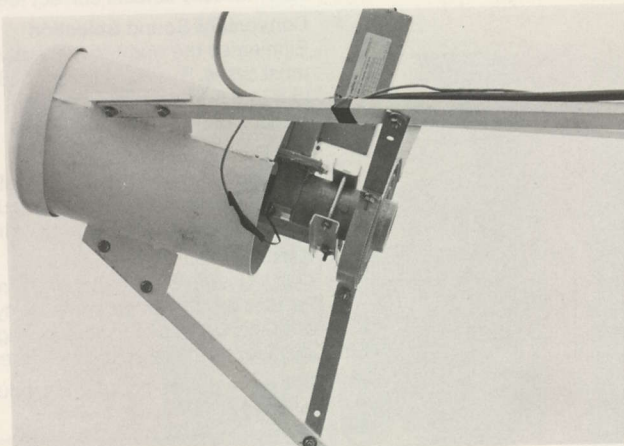
We equipped the dish with a recently introduced dish motorizing system from **Delta Satellite Systems** (the **DRACO Aimer** series). A review of the performance of that dish drive and control system will appear in **CSD** in our February ('84) issue. Suffice to note that after a month of service, the Aimer package is performing without any hitches or glitches.

And now performance from a picture quality vantage point.

Our first comparison was between the new 11 footer and the older style 13 footer; both from ADM. The older 13 foot antenna had the prior-art parabolic in one direction panels, plus, it got its 13 foot aperture by adding 'extender panels' to the basic 11 foot antenna. (The newest 13 footer from ADM is, like the 11 foot subject here, parabolic in both directions and created from full panels **without** the extension panels). The 11 footer was from .5 to .75 dB 'hotter-than' the older style ADM 13 footer. In a marginal reception area, that is not an insignificant improvement.

Our second comparison pitted the 11 foot ADM against the 12 foot Paracclipse. We found the two antennas were in a dead heat; **no significant nor repeatable differences in performance between the two antennas**. To those who find that an incomprehensible statement, some discussion about what it really means.

No antenna **test range** measurements directly comparing the Paracclipse 12 against the ADM 11 footer were made. We operate an analysis lab but not a certified test range. We can and do measure performance however and take the usual precautions of using the same electronics on both antennas (when two are being compared), carefully optimizing both antennas, and measuring real numbers with suitable carrier to noise ratio measurement equipment.



FEED is centered into proper position using a centering ring initially introduced for the 20 foot ADM series. The shroud provides protection for the feed system pieces.

FIRST CANADIAN SATELLITE EXPOSITION

FEBRUARY 3, 4, 5, 1984



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Booth: 32, 33, 34 & 35
Evolution Audio
Burlington, Ont.
Booth: 3 & 4
Mustang Communications
Vancouver, B.C.
Booth: 44
General Instrument
Burnaby, B.C.
Booth: 42 & 43
Industries PPD Inc.
Sherbrooke, Que.
Booth: 31
Acutator Control Technology
Fort Worth, Texas
Booth: 53 & 54
UP Satellite Dish Company
Escanaba, Mich.
Booth: 50
The Book Publishing Company
Summertown, Tenn.
Booth: 8

Nampa Satellite Systems
Nampa, Id.
Booth: T38
Com Sat
Winnipeg, Man.
Booth: 45 & 46
KLM Electronics
Morgan Hill, Cal.
Booth: 14 & 15
Columbia Satellite
Portland, Org.
Booth: T63
Fox Distributors
Delta, B.C.
Booth: 11, 12 & 13
Ma-Com Trodelin
Clairemont, N.C.
Booth: 29
MTI Systems
Salt Lake City, Ut.
Booth: T67 & T68
Sky Touch Systems
Salina, KS
Booth: T34 & T35

Terra Com
Langley, B.C.
Booth: 47
Telescan Inc.
Regina, Sask.
Booth: 47
Boman Industries
Downey, Cal.
Booth: 40 & 41
Bridgeport Imports
Richmond, B.C.
Booth: 17
Satellite Systems Ltd.
Burnaby, B.C.
Booth: 18
Conference Cassettes
Lake Havasu City, Az.
Requires a small table
SFP Designa
Corte Madera, Ca.
Booth: T33
Galaxy Guide
Burnaby, B.C.
Booth: 49

Speakers

Scott Muirhead—Fox Antennas
Mark Long—Solar Electronics

Frank Ogden—21st Century Media
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Chris Budd—CSPACE
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Galaxy

GUIDE

THE ENTERPRIZE WILL BE THERE
WILL YOU?

The 12 foot Paraclipse has 1 foot of size on the ADM 11 footer. The 12 foot Paraclipse is a mesh antenna with superior design qualities (see CSD for January 1983). The "Clipse" 12 foot surface obtains its 'parabolic' surface by 'forcing' the screen mesh to tightly adhere to the support super structure with wire clips. The metallic surface of the dish, the mesh, is not parabolic to begin with. It gets parabolic in the installation process when the installer does a proper job of clipping the surface to the support structure. However, even when this is done with a high degree of attention to the end result, there is no way that the surface can conform 100% to the 'parabolic-two-ways' curve. It comes close, or it would not work as well as it does in the field. But it is not a 'perfect parabolic surface.'

The ADM 11 footer, on the other hand, depends not upon the installer for its 100% accurate parabolic two-ways curved surface; rather, it depends upon the accuracy of the ADM tool and the manufacturing process for its surface accuracy. Short of the installer getting so fouled up that he finds himself attempting to 'force' the 12 petals together by drilling new holes to attach petals together in a manner they were not designed to attach together, the installer cannot 'go wrong.'

This hands a slight antenna performance lead (or efficiency improvement) back to the ADM side of 'the court.' That improvement in efficiency is neither insignificant nor substantial. It is, simply put, 'just enough' to make the two antennas dead-heat competitors in the performance department.

LONG Term

The original Provo antenna, as noted earlier, was an ADM 11

footer. That same antenna, now more than 3 years operational in a basically 'hostile-to-metal' environment (high humidity, salt spray, etc.), is our reference 13 footer used in these tests (the 2 foot of extension having been added in the interim). There has been no rusting or surface degradation of the dish in that period of time; something we can say about no other antenna on Provo.

The newest ADM antenna series are from the same metal and finish system that our original 11 footer was. Some minor improvements in the finishing are claimed by ADM but we can't see how you could improve much on that department. We do suggest that since you have some angular adjustments for the declination (with the pipe or post type mount) that it would be advisable to liberally grease-down the adjustment all thread rods or bolts after the installation is completed so that adjustable parts cannot 'freeze' on you over a long period of time.

NOT SO Good

At the risk of belaboring an already sensitive point, what is missing from the package **as we prepare this report** is an adequate assembly, installation and 'proofing' manual for the antenna. Anyone who has ever assembled any ADM antenna will not find the newest version significantly different from older versions. But a first time installer will spend an extra hour or two figuring out where the pieces go.

ADM is, however, now nearing completion of a set of manuals for their various antennas; manuals which should, finally, make the antenna assembly process less frustrating for those who lack the proper experience.

SATELLITE DISTRIBUTION SYSTEM

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OVER THE MOUNTAIN

In the dawning years of television in the United States, any television reception beyond 50 miles from the transmitter was considered to be unusual. In fact an entire industry grew up to support this type of reception and it became known as the 'fringe area television industry.' Many companies made their fortunes plying this trade; Channel Master and Winegard were two of the pioneering firms, in the 50's, to create products which made 'fringe area' television work; better.

In the same dawning years of television there was a popular afternoon program on the original NBC network. The program featured the singing talents of an unlikely lady for stardom, a Kate Smith. Ms. Smith always opened her program by singing about the moon coming over the mountain. It was appropriate because in those days television signals didn't travel over mountains. Or hills. Or big clumps of trees. At least not directly.

There were many efforts to change this. Westinghouse tried to equip renovated World War Two bombers with transmitters and they flew in giant figure 8 patterns over Indiana and Ohio transmitting television signals to homes several hundred miles away from heights approaching 20,000 feet. At one point they were so serious about 'Strato-Vision' that they petitioned the FCC to allow them to fly a whole fleet of bombers spaced across the United States in 400 mile jumps, to create a coast to coast network. The FCC said no.

Undaunted, others tried installing transmitting antennas on tethered balloons that flew thousands of feet above ground. Still others figured out if they could install the television **receiving antennas** on tall hills or mountains nearby to where they lived, they could 'pipe' the reception down into the valleys below. People, it seems, like to live in valleys. Not on top of hills or mountains. And so the cable TV industry was born.

The concept of sharing reception, using a single, common 'tall' receiving antenna, or a single, elevated, transmitting antenna pre-dates all but the earliest of television efforts. And in a very real sense, the satellites we enjoy today are but an outgrowth of this early, primitive technology and with their 22,300 mile 'height' they have attained the greatest reach of all.

Still, there are people who do not receive television. Not directly, anyhow. And as wonderful as satellite technology is, there are still those **economic** barriers to consider. A system that works, but which is priced out of reach of the average person or home, is not much better than having no system at all. Is there not some way to have the best of both worlds; the reach and saturation of the 22,300 mile high satellite, and the low-cost of a discount house television receiver? It turns out that there is such a choice.



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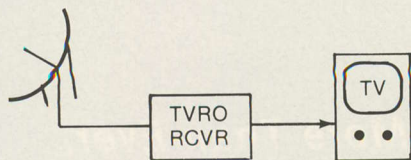
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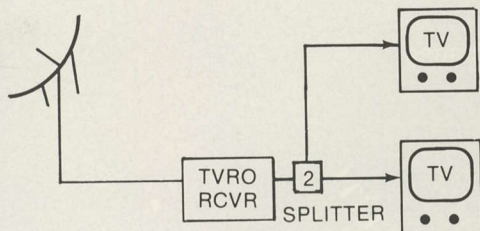
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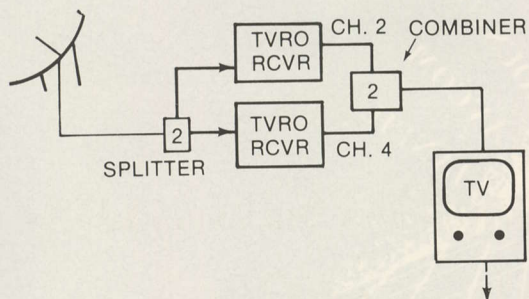
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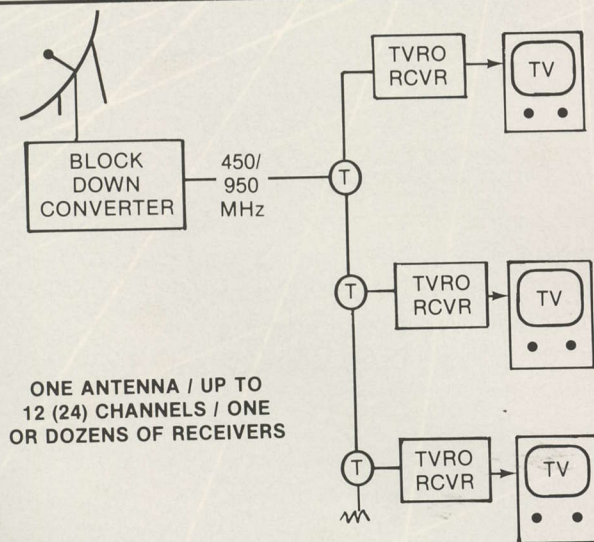
ONE DISH / ONE CHANNEL / ONE RECEIVER



ONE DISH / ONE CHANNEL / TWO RECEIVERS



ONE DISH / TWO CHANNELS / ONE OR MORE RECEIVERS



ONE ANTENNA / UP TO 12 (24) CHANNELS / ONE OR DOZENS OF RECEIVERS

SHARING The Signals

Let us review the various ways that a single TVRO antenna system can perform, and what the technology and hardware is for each of the variations in the basic system.

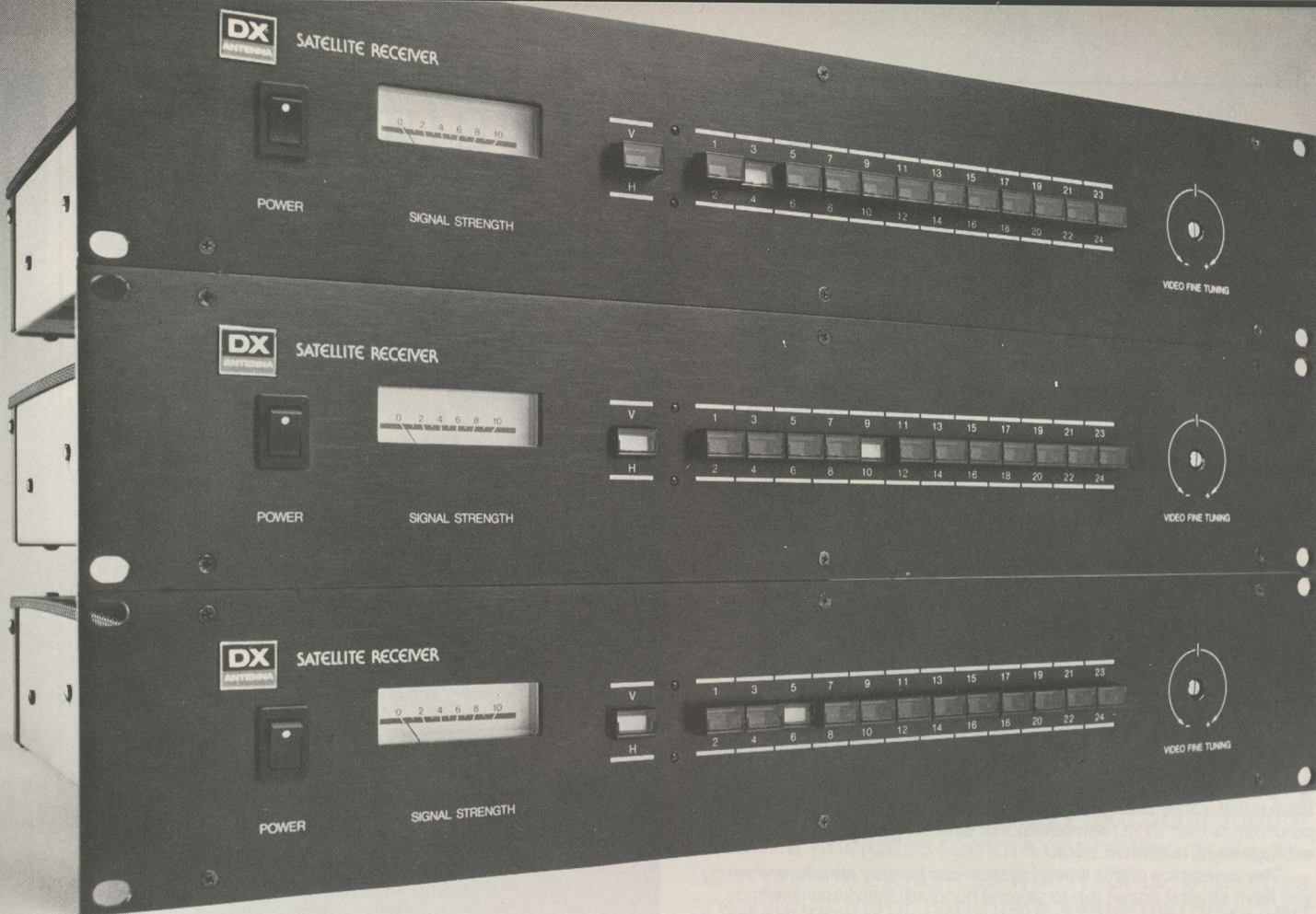
- 1) **One Antenna/ one receiver.** This is your most basic system. There is a TVRO dish, connected to a TVRO LNA connected to a TVRO receiver (down converter and demodulator) connected to a single TV receiver. One set, one program at a time.
- 2) **One antenna/ two or more receivers.** Now we go into the system and break the piece of wire or cable that connects the output of the TVRO demodulator to the single TV receiver and we install a 'signal splitter' device. This allows the modulator portion of the TVRO receiver to send its signal to two or three or perhaps a dozen receivers. And this allows each separate TV set, say in a single home, to tune in the satellite TV program independently. Well, almost independently. The guy who has the first television set, the one close to and controlling the TVRO receiver, selects the program (TVRO channel). Everyone watches what he (or she) wishes to watch. What we have really done here is to extend the viewing region to multiple rooms, although we have **not** extended the viewing choices.
- 3) **One antenna/ multiple program choices.** We start off with a single antenna and we may equip it with either a single LNA (for a single polarization) or we may equip it with two LNAs (one for each polarization). Now we connect the LNA(s) to two or more separate satellite receivers and each of these satellite receivers can tune in from 1 to 12 different channels of programs; one at a time. The output of the satellite receivers connects to one or more television receivers; perhaps one of the satellite receivers has a modulator inside of it for channel 2 and the other satellite receiver has a modulator for channel 4. Now you can turn the TV set dial from channel 2 to channel 4 and view two separate satellite delivered programs without changing any of the controls on the satellite receiver itself. This two-channel choice could in turn be connected to one TV set or many TV sets, using low-cost signal splitter devices that share the output of the receiver modulators with several different sets simultaneously.

Carried to its extreme, a system could have 24 separate satellite receivers, each tuned to one of the 24 satellite channels, and 24 separate TV channel modulators (2 through 13 for 12 channels; the rest using mid or superband 'A'/'B' etc. channels). And carried to its other extreme, hundreds of TV sets could be cable connected to this 24 channel 'system' and then each would have independent access to each of the 24 transponders on a satellite. Some form of this happens to be your basic 'SMATV' or satellite master antenna system.

Having 12 or 24 separate program choices is nice. Especially when we all know that some of the more popular satellites have up to 24 separate program choices to select from. Having a system that allows each of the different (multiple location) TV sets to have totally independent access to 12 or more channels is also nice. It is much like giving each of the users of the system their very own satellite dish. But . . . it normally costs money. Lots of money. And, it **normally** only becomes cost effective when there are hundreds of different TV sets in hundreds of different locations connected to the same system. Normally.

- 4) **One antenna/ Shared TVRO choices.** The element in the system, when you are giving independent program choice to independent receiver locations, which **drives the price** of the system **up** is the combined cost of installing a full satellite TVRO receiver and a cable-quality (TVRO) modulator at the antenna (headend) for each of the channels to be received. There is another way, as the October 1983 issue of **CJR** reported. Here is how it works.

A single dish is equipped with an LNA and a block down converter. The block down converter moves the 3.7-4.2 GHz satellite TV 'band' down to 450-950 MHz. If the dish feed is on vertical polarization, and pointed at F3R, all 12 of the channels are present; only they have been moved from the microwave band to the UHF TV band. The output of the down converter, in the +6 to +10 dBmV region (an indication of relative signal



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strength), is then fed into a UHF TV MATV type amplifier. The amplifier makes the signals 35 or so dB stronger. Now they are in the +40 dBmV signal strength region and that is sufficiently powerful to allow you to feed the signals into cable; perhaps hundreds of feet of cable.

Using MATV/CATV techniques, the hundreds of feet of cable is carried around a home or multiple-dwelling building, or neighborhood. As the cable passes by each room/dwelling where there is a TV set to be connected, a signal tap-off device is inserted into the cable line and a small amount of the total signal (voltage) present at that point is 'bled' into the home or room.

Within the home/room, you then install a TVRO demodulator; the kind that tunes the 450-950 MHz block down conversion frequency range, producing TVRO pictures from the back of the demodulator (receiver) which can be viewed on the standard TV receiver.

If the TVRO antenna is pointed at F3R, as in our example, every TV set connected to the cable coming from the antenna and support electronics has individual, independent access or tuning of the 12 channels on vertical; 1, 3, 5 and so on through 23. One TV set or home can watch PTL, another can tune in ESPN, a third can tune in CNN2, and so on.

Each of the homes shares in the cost of the single antenna/LNA/down converter and each home (outlet) shares in a pro-rated cost of the cable system which connects their TV set to the 'master antenna.' Each outlet, if they are located in different dwellings, would individually purchase its own TVRO demodulator or tuner. **A typical cost sharing arrangement is shown here.**

The economics of this type of system can be very attractive when you have several dozen (up to several hundred) individual dwellings or TV outlets within say no more than a mile or so of 'cable' from the master antenna (headend). All of the parts are available 'off the shelf' and as **CJR** for October reported in considerable detail, several firms in our field have a nice, profitable business going in this field today (*).

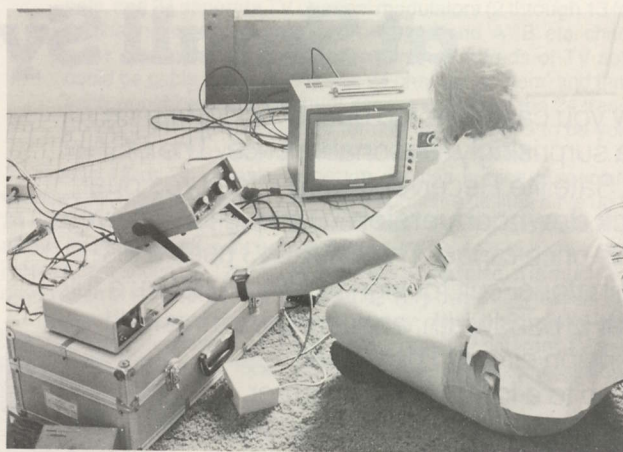
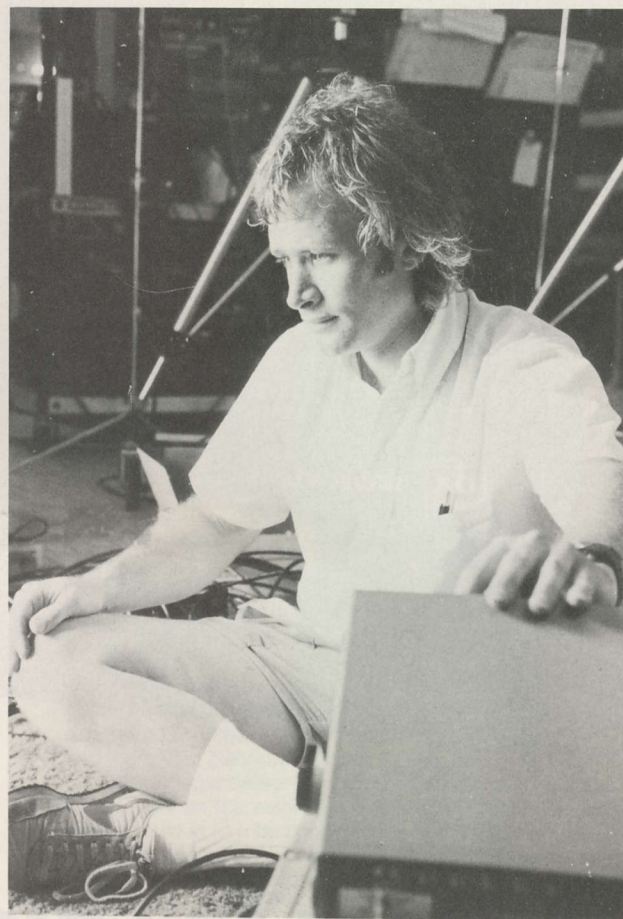
However, suppose the homes are not densely packed and a mile or so of cable will not reach sufficient homes to justify the shared-cost system approach. Then what?

- 5) **One antenna/ Shared TVRO Choice — Through The Air.** If the housing density nearby the TVRO master antenna is light, and if cable cannot reach sufficient homes to make the system economical, then how do you create a technical system which still allows multiple locations to share the same TVRO antenna/LNA and down converter? The answer is throw away the cable and substitute 'the air' for the cable!

During the month of September TX Engineering's Roger Linde and David Lantz brought some of their equipment to Provo. While on Provo we installed a 'through-the-air' shared distribution system and nick-named the system SDS for Satellite Distribution Service (or System, if you prefer).

CABLE vs. AIR Losses

Let's go back to the down converter and some basic principles. Every installer of TVRO systems is aware that the equipment (receiver) manufacturers make certain statements in their literature regarding 'cable lengths.' They specify a maximum length of cable between the LNA and the down converter (typically RG-213 cable), and, they also specify certain maximum (and minimum!) lengths between the

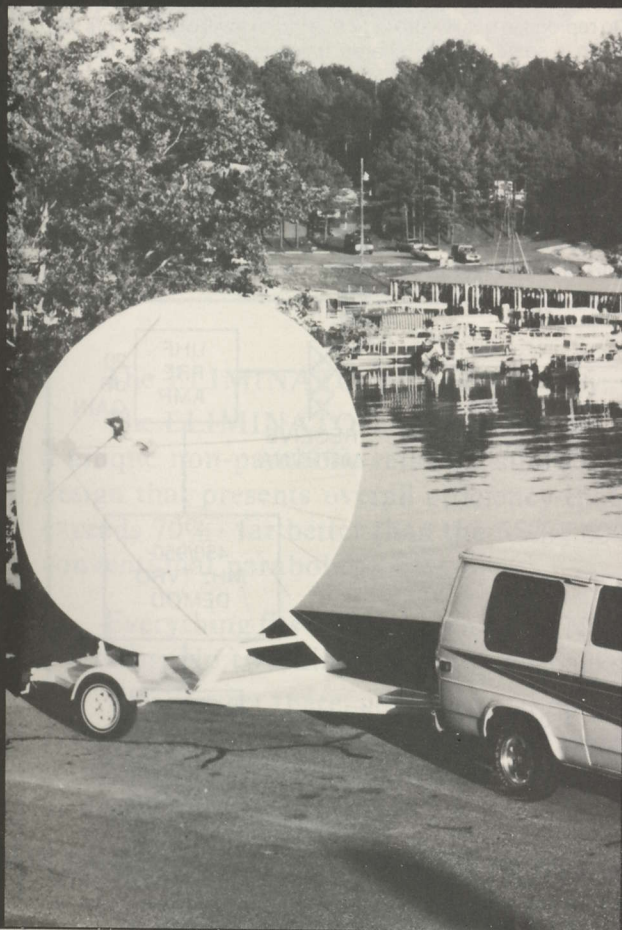
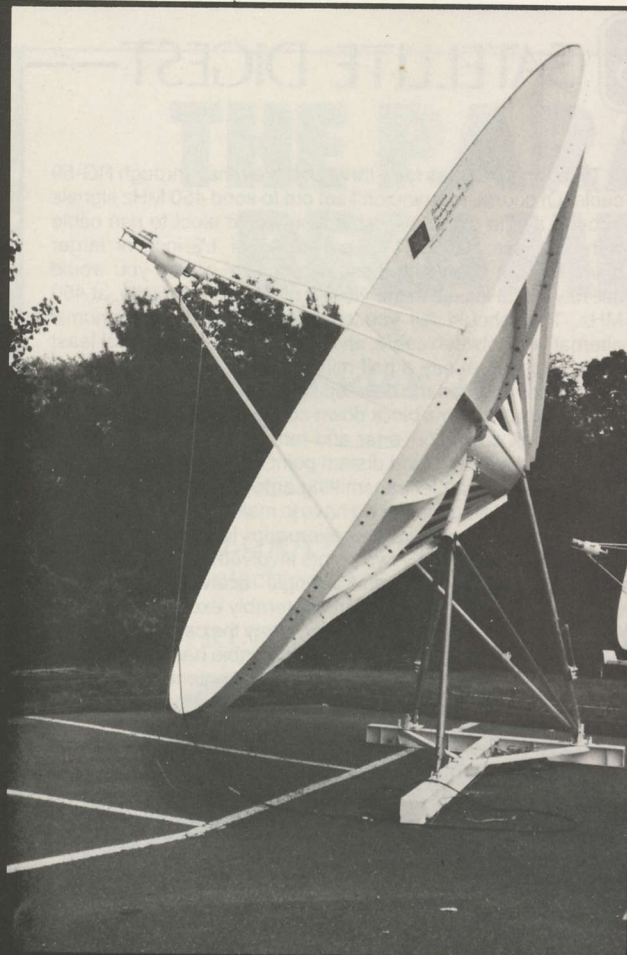


DAVID LANTZ of TX Engineering on Provo dialing up the distant-source SDS signals on his TX-200 receiver.

outdoor mounted down converter and the indoor demodulator (receiver). Such limitations are imposed because all cable has 'loss,' or 'resistance' to the flow of signal energy. The longer the piece of cable, the greater the total 'resistance'/loss. Too much resistance/loss and the signal that started out bright and clear at the down converter is filled with noise (because of too low a signal level) at the demodulator.

Installers are also aware that when you cannot reach from the down converter to the demodulator with a piece of common RG-59/U, because of excessive length and losses, you have another option; use a larger cable size (such as RG-6) which offers lower resistance per

*/ **CJR** reported that TX Engineering of Renton, Washington (P.O. Box 7007, 98057; 206/228-0980) has developed a specialized receiver package for CTN (Custom Television Network) application and to back the product, a marketing plan selling the systems to trailer parks, condo developments and other multiple dwelling locations. Given certain engineering constraints, the TX Engineering system also allows the installer to 'park' the TVRO antenna half way between vertical and horizontal polarization thereby providing 12 plus 12 (or 24) separate channels to each receiver location. Copies of the **CJR** October issue are available on special order for \$5 (US funds) each from **CJR**, P.O. Box 100858, Fort Lauderdale, FL 33310.



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increment of cable, and therefore lower loss between the two points. All of this is pretty basic, but important to review before we enter a brave new world.

One solution to too much cable loss, as noted, is to use larger or better quality cable. Another solution is to **raise the signal level at the output of the down converter** so that while the cable loss stays constant, you start out with more signal 'level' at the down converter. When there is more signal to begin with, you end up with more signal at the 'far end' of the cable.

Amplifying the signal stronger is also basic to a cable distribution system that will carry the signals around a large home, or multiple dwelling development, or neighborhood. That is the basic premise of the cable television system.

At some point you can begin to think about eliminating the cable, between two points, and rather than using cable to carry the signal, use one antenna at the 'origination/transmit' end of the circuit, and another antenna at the receive end of the circuit. **The air**, between the two points, becomes a 'conduit' connecting the two points. **That is a basic premise of broadcasting.**

And that is the basic approach being followed with the Satellite Distribution Service; replacing cable with 'air' and allowing the antenna/down converter to 'broadcast' in the block down version frequency band (i.e. 450-950 MHz).

Let's compare some of the losses involved here.

- 1) **Through cable** — suppose we wish to connect two points, one mile apart, together using RG-59/U cable. We know (or you should know!) that the loss of cable (any cable) increases with frequency. There is (far) more cable loss at say 450 MHz, than there is at 70 MHz. Both of these numbers are relevant since most home TVRO receivers currently use an 'IF' of 70 MHz while the block down conversion units being discussed here use a wide IF that starts at 450 MHz and goes all the way up to 950 MHz (being 500 MHz 'wide,' just as the satellite band itself is 500 MHz wide from 3,700 to 4,200 MHz).

The loss of our 1 mile of RG-59 cable at 450 MHz is on the order of 7.5 dB per 100 feet. So in 5280 feet we have a total potential loss of 396 dB. That is a bunch of dB. Just for reference, the same RG-59 cable cited at 450 MHz would have around 2.5 dB of loss (per 100 feet) at 70 MHz and if for some reason you wished to run a mile of it, you would have 132 dB of loss.

- 2) **Through the air** — suppose we wish to connect two points, one mile apart, together using no cable; just the air (with a suitable 'antenna' to 'launch' the signal at the origination end, and a suitable antenna to 'capture' the signal at the receive end). What would the 'loss' through the air be? At 450 MHz the loss would be around 90 dB.

True. There is **less loss** through the air than through RG-59 cable! Of course you wouldn't set out to send 450 MHz signals through a mile of RG-59 cable; you would elect to use cable with less loss; say CATV type cables of 1/2 inch or larger diameter. But even with these 'expensive' cables you would still have total losses in the vicinity of 200 dB for a mile, at 450 MHz. That should tell you something about the economic alternatives between cable, and 'air.' Air is often better, at least over distances of say a half mile or more.

So now we have a scenario developing. We install a TVRO antenna and connect the LNA to a block down converter. Then we take the output of the block down converter and rather than feeding it into a piece of cable and heading for a distant point, we connect it to the air by interfacing with a suitable 'transmitting antenna' and an amplifier. The amplifier is required because we have to make up for those losses through the air just as we have to make up for losses in cable.

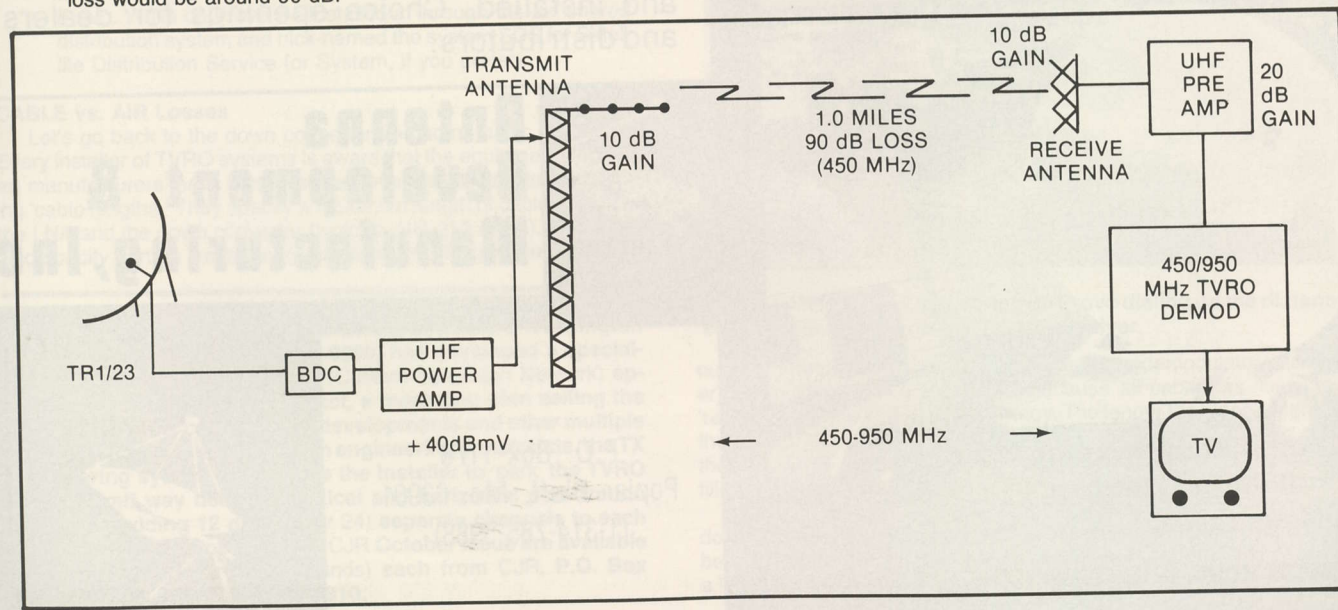
Now if our system had only two points involved, the origination or transmission point at the dish, and a single receiving point a mile away, our 'story' would be forceful but not terribly exciting. However, now comes the real advantage to throwing away the cable and substituting the 'air' as a transmission medium. The cable has to be directly run from the origination point to **each and every** potential user point along the way. You can't get television reception from a cable if you can't reach the cable!

But when you transmit through the air? Now you can set up receiving points **any place** in front of the transmitting 'beam' of the origination end transmitting antenna. Those points can be scattered all around the transmitting location, in a straight line, or simply dotted about the country side. Now you are **really** doing a job cable **could not do**; you are reaching everyone within 'range' of the transmitting antenna all from a single origination point, with no cable at all!

MEANWHILE On Provo

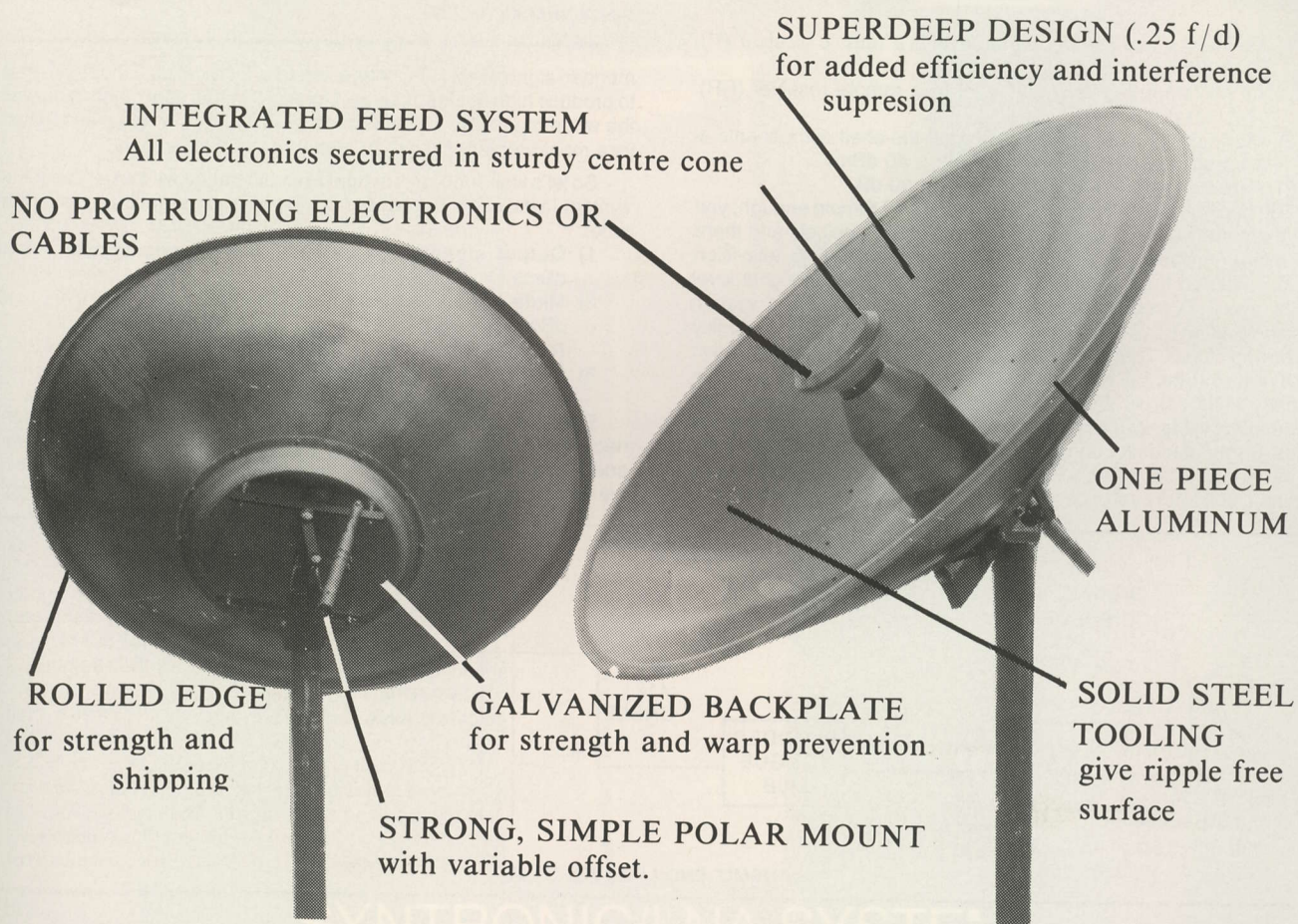
The game of substituting 'air' for cable is really a relatively simple study in numbers; dB numbers. Here is how it works.

- 1) Determine the minimum acceptable signal strength you need to reproduce quality looking TV pictures at all of the points you wish to serve with the 'shared' antenna. This has two factors; distance, and line of sight. Distance is simply the straight line distance between the origination point at the furthest receiving point. You can do this by adding and subtracting dBs as we will see.
- 2) Determine whether from your planned origination/transmission point you have direct 'line of sight' between that point and all of your receiving points. **Line of sight?** That means you can stand at the point or height where the transmitting antenna will be mounted or installed and 'see' the point on or above each of



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You say there is a hill in the way? Probably trouble. A hill adds to the 'loss' of the transmission path. We'll touch on how much. You say there is a big row of trees in the way? Trouble, but not as much as the hill. Trees also subtract signal by increasing the loss along the path. Remember that 90 dB of 'loss,' through the air, for a mile of distance? That is 90 dB of loss if you have a clear, 'unobstructed' view between the two points a mile apart (at 450 MHz).

Now let's plug in some real numbers. And see how we solve the signal level equations.

- 1) Minimum recommended signal level to a 'remote receiver' (**):
- 10 dBmV
- A) Minimum usable signal level to a remote receiver (RR):
- 20 dBmV
- 2) Maximum output available using off-the-shelf components at the transmission end of the circuit: + 40 dBmV
- 3) Path loss at 450 MHz at 1 mile: (-) 90 dB.

The decibel. Or dB. How do you work with it? Simple enough; you add them and you subtract them. There are plus decibels and there are minus decibels because thirty years ago the cable television industry started out by establishing a certain minimum signal level which every TV receiver connected to a cable television system should receive if the receiver was to see 'perfect' (well, high quality anyhow) pictures. That level happened to be a certain signal 'voltage'; **1,000 microvolts**. But microvolts were hard to work with so the cable industry (The Jerrold Corporation, actually; now GI) decided that **1,000 microvolts would represent 0 dBmV**. For the really technical types, dBmV stands for decibels above 1 millivolt. One millivolt is the same thing as 1,000 microvolts. Thus **0 dBmV is not 0 signal**; it really means **1,000 microvolts of signal** which is by judgement the recom-

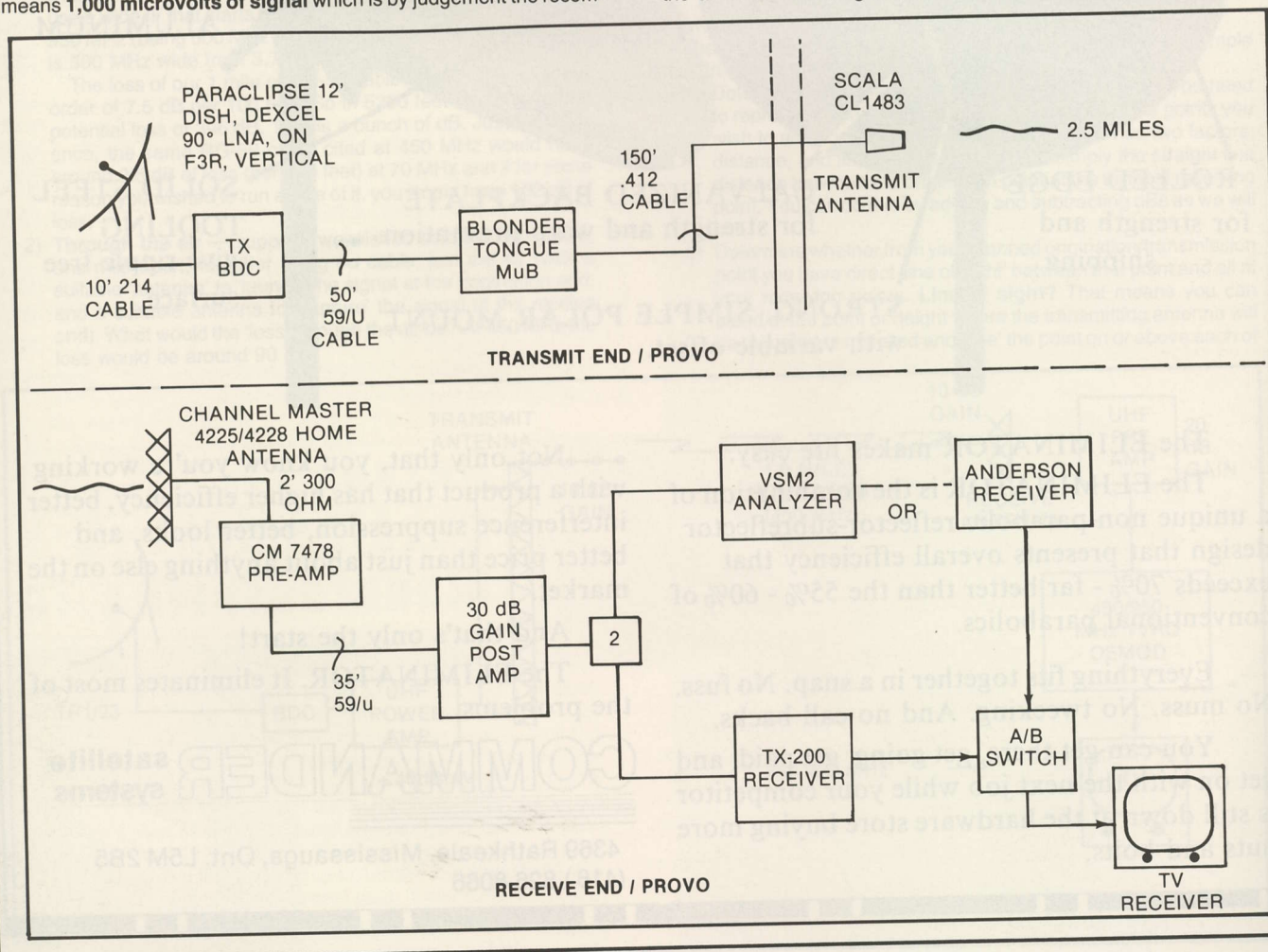
****/ If - 10 dBmV is the minimum recommended signal to a TVRO receiver (remote receiver) connected to the remote transmitter/source, why does the cable industry specify 0 dBmV or 10 dB more than - 10 dBmV for cable TV use? The cable industry delivers 'AM' signals from terrestrial TV stations to the TV receiver while the TVRO industry delivers FM signals from satellite 'stations' to the TVRO receiver. FM works better than AM, requiring less 'real signal' to make perfect pictures. This 'FM advantage' is directly evident to us as we plan our systems; we can 'get by' with less signal 'voltage' to our receivers than cable can to their receivers. We have a distinct advantage over cable in this respect, thanks to 'FM.'**

mended signal level to be connected to a TV receiver if the receiver is to produce high quality pictures. None of this has very much to do with the world of satellite TV, except as we may 'borrow' the cable industry's measurement system to measure our own signals.

So let's walk through a simple exercise before we look at the actual system installed in September on Provo and operational since that time.

- 1) **Output signal level** available from transmitter end = + 40 dBmV
- 2) **Minimum suggested input** to remote receiver (RR) = - 10 dBmV
- A) Difference between the two = 50 dB
- 3) Path loss at 450 MHz for 1 mile = 90 dB
- A) Difference between 50 dB and 90 dB = (-) 40 dB.

Forty dB. What does that number mean? Simply this. If we connected the + 40 dBmV output of the transmitter to the air at one end and we connected the receiver terminals of the remote transmitter to the 'air' on the receiving end, we would be **40 dB shy** of having enough



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signal to make the receiver play. That suggests we need an amplifier to get our 40 dB back.

FINDING 40 dB

We do not simply 'dump' the +40 dBmV output signal from the transmitter into the air, of course. We connect it to a transmitting antenna. If we are reasonably careful about selecting our transmitting antenna, we can 'gain' some of our missing 40 dB here. How? By selecting a transmit antenna which itself has 'gain.' For this example let's make an assumption. We have chosen a transmit antenna with **10 dB of gain.**

Now we have 10 dB of the 40 dB we were shy, 'found.' We still need to find another 30 dB of 'missing gain' (or loss) to make the system play properly.

If we don't connect the transmitting amplifier to 'the air' directly, but use an antenna with 'gain,' we also don't connect the receiver (RR) to the air either. So we select another antenna for the receiving end and for simplicity we will select another receiving antenna with gain; 10 dB of gain. Now we have found **another 10 dB** of our missing dBs and rather than being 30 dB 'shy' we are now 20 dB shy. And that sounds like we need an amplifier.

Since we have already placed an amplifier at the transmitter end (there's how we got the +6/+10 dBmV signal level out of the down converter to build to +40 dBmV), this suggests we need some type of signal amplifier at the receiving end as well. One with 20 dB of gain. It just happens that for around \$30 US cost there are a half dozen or so UHF TV band consumer type receiving amplifiers available with 20 or so dB of 'gain.' That makes our selection process simple enough; we install one of these signal pre-amplifiers at the receiving antenna (RR) site and now we have the gain we need.



SCALA CL1483 TRANSMIT ANTENNA/ being hung at the 100 foot level on WIV tower for test of SDS system.



PREPARING a 4 bay bow-tie antenna, WIV's Marshall Foiles rigs the short 300 ohm jumper from the bow-tie feed point to the input of the antenna signal pre-amplifier.

HOW It Works

When TX Engineering's **Roger Linde** and **David Lantz** were on Provo in September, we installed a system which approximates the numbers given here. We'll refine the numbers, taking into account some additional 'losses' in the path, before we get all done. For now, let's concentrate on how the system functions.

First we took a 12 foot dish and equipped it with the TX down converter. Then we connected the output of the down converter to a Blonder Tongue model MUB signal amplifier for the UHF TV band. This provided our +40 dBmV output, which in turn was connected to a **SCALA** model CL1483 (transmitting) antenna. The transmitting antenna was mounted 100 feet above ground on the 'side' of the existing WIV tower.

At the remote receiver (RR) site we installed a four-bay bow-tie type of antenna; common in the UHF TV world and sometimes called a 'cat whisker' antenna, because of its cat-whisker-like dipole antenna configuration in front of the screen reflector. Through a short run of connecting wire we connected the bow tie antenna to a UHF TV signal pre-amplifier and then ran some RG-59/U cable to the TX Engineering 200 model receiver. The distance was actually 2.5 miles and the only link between the two points was the 'air.'

The TX-200 receiver then functioned the same as it would had it been **directly** connected, **via cable**, to the down converter. You tuned the tuning knob to change satellite TV channels, tuned the audio subcarrier knob to find and listen to different audio sub-carriers, and



FOUR BAY bow-tie or cat whisker antenna with Channel Master 7478 antenna mounted pre-amplifier (300 ohm input and 75 ohm output) in use on Provo at 2.5 miles from the transmit site.

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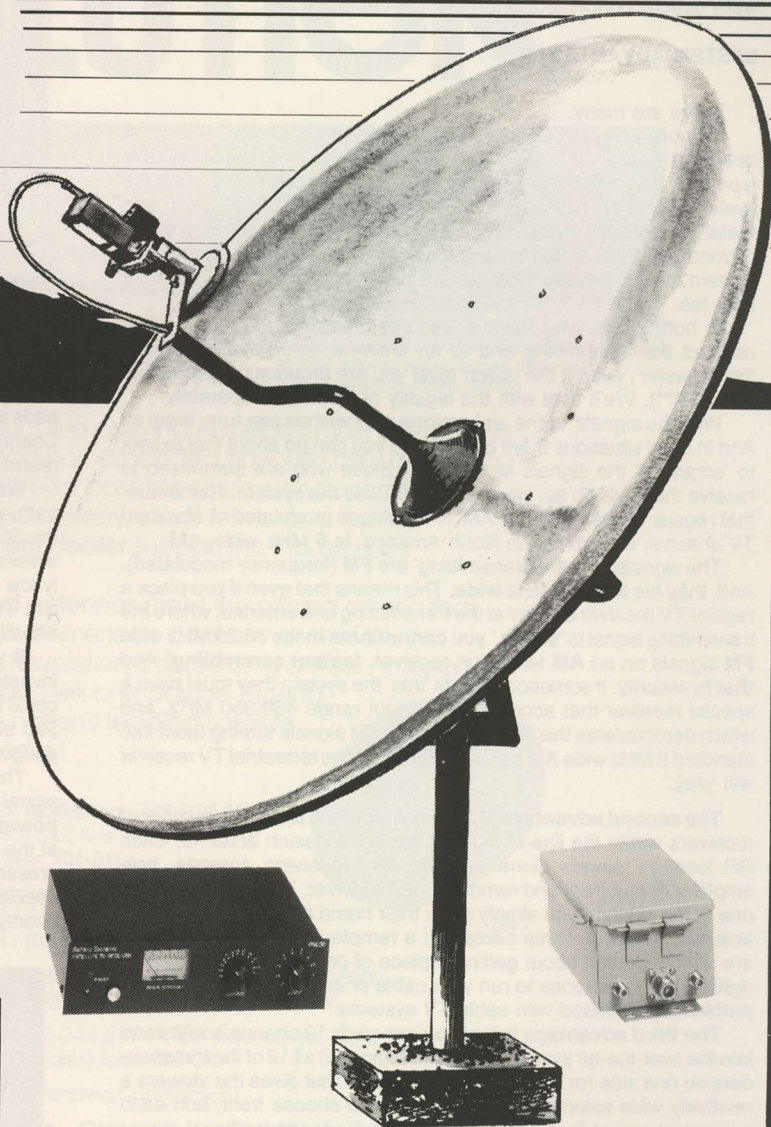
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interconnected the TX-200 to the standard TV set through the built-in modulator in the TX-200 just as you would in a 'normal' TVRO installation. The only 'magic' was that we were 2.5 miles from the TVRO dish and we were **not directly connected** to the dish at all. Come to think of it, that is quite a bit of magic at that!

The picture and sound quality? With some limited exceptions that involved special circumstances peculiar to the Provo 'environment' there was no noticeable degradation of the satellite TV reception 2.5 miles removed from the dish antenna; the pictures looked like they looked at the dish proper and the TX-200 receiver performed as if it were directly connected to the dish by cable.

SYSTEM ADVANTAGES

There are many.

Number one, to us at least, is that the system is 'secure.' Now what does that mean? We have to assume that anyone who duplicates this type of system will do so because they want to make money with the system. There are two ways to make money with a TVRO system; you make your money by selling and installing it for a profit above and beyond what the materials and labor cost you, or, you operate the system as an on-going 'service' and you make money by charging a user fee.

In both cases, you have a 'security problem.' As soon as you connect the transmitting end to an antenna, you have become a 'broadcaster'; even if the power level you are broadcasting at is 'flea power' (***). We'll deal with the legality of all of this separately.

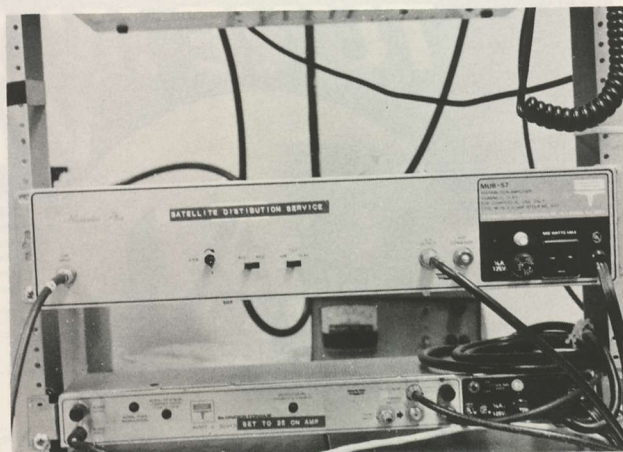
With the signals 'in the air,' anyone who wishes can tune them in. And in most situations there is not much you can do about that except to 'scramble' the signals so that only those who are authorized to receive them will do so. Here is the bonus to the system. Remember that regular terrestrial TV is 'AM' or amplitude modulated. A standard TV channel, transmitted in North America, is 6 MHz wide, AM.

The signals **you** are 'transmitting' are **FM** (frequency modulated). And, they are **30 to 36 MHz wide**. This means that even if you place a regular TV receiver directly at the transmitting end antenna, where the transmitting signal is 'strong,' you **cannot tune in** the 30/36 MHz wide **FM** signals on an **AM** television receiver. **Instant scrambling!** And **that is security**. If somebody wants 'into' the system they must have a special receiver that accepts as its input range 450-950 MHz, and which demodulates the 30/36 MHz wide FM signals turning them into standard 6 MHz wide AM type signals which the terrestrial TV receiver will 'play.'

The second advantage is that you can place an infinite number of receivers within the line-of-sight of the transmission antenna. Each RR location 'stands alone' with its own receiving antenna, pre-amplifier (if required) and remote TVRO receiver. To 'connect' someone to the system, you simply go to their home and install a UHF TV antenna, pre-amp, some cable and a remote satellite receiver. You are not concerned about getting a piece of cable to them or gaining rights of way clearance to run your cable or any of those other nasty problems associated with cable TV systems.

The third advantage is that you can pack 12 channels with ease into the over-the-air system, using (for example) all 12 of the transponders on one side (or the other side) of F3R. That gives the viewers a relatively wide selection of programming to choose from, and each can select any of the 12 program sources independently.

***/ The +40 dBmV output level available from off-the-shelf commercial MATV amplifiers such as the Blonder Tongue MUB model is at best 'flea power'; well under 1/1000th of a watt of 'transmission' power. The amazing performance over paths to perhaps 5 miles in line-of-sight length is possible because with an FM signal, wideband modulated as satellite TV signals are, you have an 'FM advantage' working for you. This 'advantage' is greater than 30 dB when compared to normal 'AM' methods of signal transmission. That 30 dB advantage can be directly added to the 'apparent' real-world power of the transmitting amplifier, for side by side system comparisons with standard AM, and when you raise 1/1000th of a watt 30 dB you have the equivalent of 1 watt of power at the transmitter end.



BLONDER TONGUE MUB amplifier, designed for MATV use, is our 'transmitter' for coverage out to at least 3 miles. It's a pretty cheap transmitter — 12 channels of service for about \$15 a channel!

SYSTEM Disadvantages

The system, as installed on Provo, was put together using off-the-shelf parts. A block diagram here on the 'real' system shows what parts are required. They are familiar names for the most part, including Channel Master, Blonder Tongue and Winegard. However, let us return to the power calculations.

We came up 20 dB short of system gain, for our example 1 mile path, when we simply connected the MUB transmitting 'amplifier' to the SCALA transmitting antenna, and the TX-200 receiver to the cat whisker UHF bow tie antenna. We made this up by installing a relatively low cost broadband UHF TV pre-amplifier at the receive antenna site. This may not be the most cost effective approach to that problem, although it surely does work.

If you have 100 receive sites, you will have 100 x \$30 or so invested in UHF TV signal pre-amplifiers. That's \$3,000. Even if you could reduce the cost to you for the UHF signal pre-amplifiers to say \$20 each, you would still have \$2,000 in purchasing 100 of these gadgets. Now what is it you are really doing here?

The answer is that you are trying to make up for a shortage of signal at the RR sites. Frankly, it makes more sense to **raise the power at the transmit site**, one time, than it does to boost the signal at the receive sites 100 times (or more). And that gets us away from presently-available 'off-the-shelf' UHF TV amplifier devices and into a special world of power amplifiers. We'll talk about solving this one, shortly.



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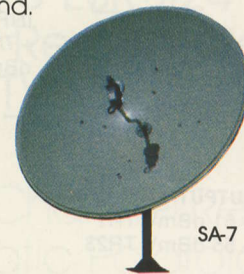
Dallas, TX SA Marketing—Southwest
817-860-6577, 357 Exchange St.,
Arlington, TX 76011 (Regional Sales)

Kansas City, KS SA Marketing—Midwest—913-829-5900,
427 N. Rawhide Dr., Olathe, KS 66061, (Regional Sales)

SA International—301-344-5111, 4450 Hardesty Rd., Huntingtown, MD
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Singapore Office—(Pending Construction)

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In our simple walk through of power calculations we utilized the power 'loss' through the air at **450 MHz**. You will recall that our system uses a block of frequencies, from **450 to 950 MHz**, for signal delivery. The truth of the matter is that our through-the-air losses are greater at the high end of the band (950 MHz) than they are at 450 MHz. Remember that loss always increases with frequency; whether the 'transmission medium' is cable, or air.

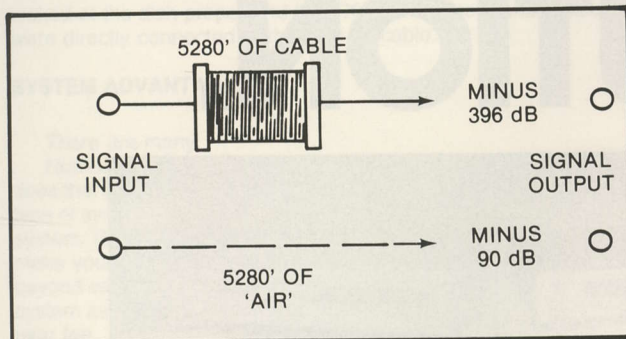
Therefore our simplistic set of calculations was really in error; we should be figuring the system losses (and gains) at the top end of the band (950 MHz) since this represents the 'worst case' losses in the system. Let's compare some of these:

Distance/Through The Air	Loss At 450 MHz	Loss At 950 MHz
0.1 mile	70 dB	77 dB
0.5 mile	85 dB	91 dB
1.0 mile	90 dB	97 dB
2.0 miles	96 dB	104 dB
5.0 miles	104 dB	111 dB
10.0 miles	111 dB	118 dB

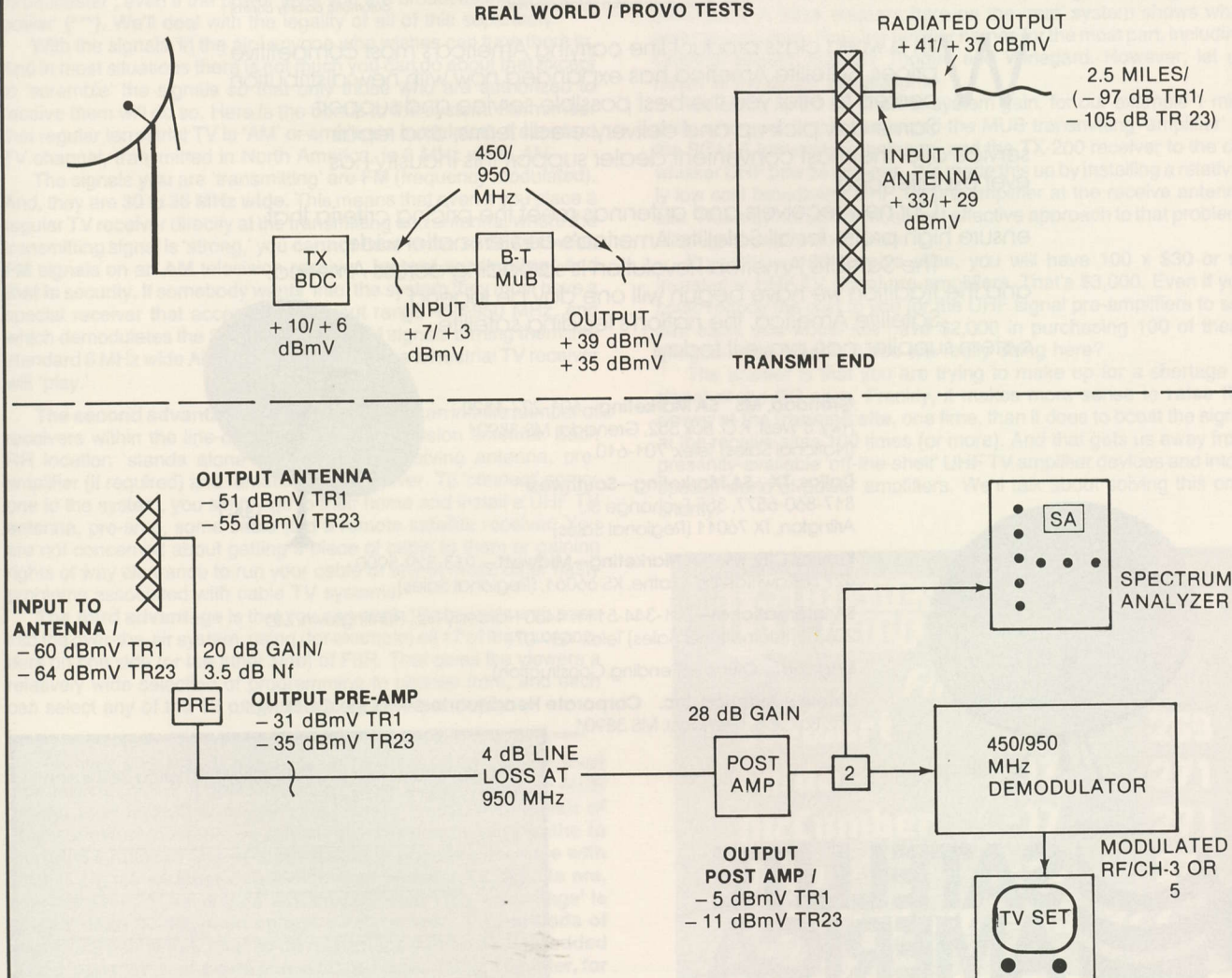
These are rounded off numbers, but close enough for computations. If you look at them closely you will notice that each time we **double** the distance the signal traverses we **add** about **6 dB** to the path **loss**. You will also notice that the biggest losses are always in the first 'few feet'; i.e. as much as 77 dB of loss between the transmitting antenna and a point 0.1 mile (528 feet) away!

These are also 'line of sight' numbers, meaning that both antennas can 'see' each other. Put some trees in the way, and the numbers get bigger. Put a hill in the way and the numbers get MUCH bigger, in a hurry. However, assuming you can get line of sight, if you can deliver

SDS/ Continues on page 50



REAL WORLD / PROVO TESTS





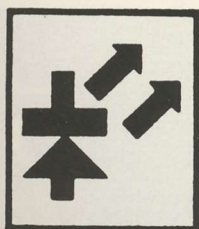
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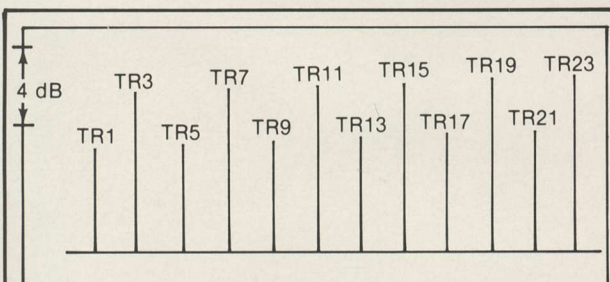
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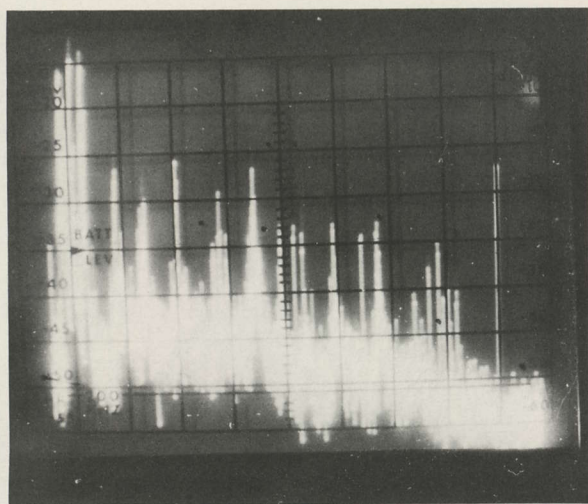
SDS/ Continued from page 46

clean signals at 5 miles with a system, you are only "6 dB away" from delivering just as clean signals at 10 miles.

Another disadvantage we found is that **not all satellite signals are 'born equal.'** In regions of the world where you have widely varying satellite signal levels, those not completely above threshold at the master TVRO antenna site seem to degrade rapidly in a through-the-air link system as described here. A practical example. On Provo, there is a 4 dB satellite EIRP difference between transponder 5 and transponder 7, for example. That means that even if you have a suitably large antenna so that the weaker channels (5 in our example) are above threshold and noise free, there will still be a 4 dB carrier level difference through the complete system between TR5 and TR7. You have to decide which of your satellite carrier levels will represent 'maximum output level' when you are adjusting your transmitting amplifier for gain (and tilt; to be discussed next). Naturally the hotter verticals (3, 7, 11, 15, 19 and 23) end up being the strongest signals through the full system and if you adjust your transmitting amplifier to correspond to this, then at each RR site your colder verticals (1, 5, 9, 13, 17, 21) will be 4 dB weaker than their adjacent hotter channels. **You can notice that 4 dB difference** in level through the SDS system even if you cannot see it at the TVRO antenna because as directly viewed, all signals at that point are 'noise free'. This suggests a



WHEN TRANSPONDER TO TRANSPONDER SIGNAL LEVELS VARY WIDELY, OUTPUT POWER AMP MUST BE ADJUSTED TO REACH 'SATURATION' ON STRONGEST SIGNALS, REDUCING RELATIVE 'STRENGTH' OF WEAKER TRANSPONDERS



VSM-2 DISPLAY/ left to right, strong 'AM' carriers from local Provo TV service (see text), satellite transponders, 3, 5, 7, 9, 11 and then at reduced amplitude 13, 15, 17 and 19. Carriers just above 19 are second harmonics from AM transmitters on Provo (again, see text).

complicated 'graphic equalizer' system to 'balance' the differing carrier levels. If you live in a region where the signals are more equal (not everyone has a big difference between the 'hot' and 'cold' verticals, or horizontals, on F3R) then you are not apt to have this 'accentuated difference' that is amplified by the equipment in the rebroadcast system. If your system has above threshold signals on the hotter verticals (3, 7, 11, 15, 19 and 23) but some noise in the weaker ones (1, 5, 9, 13, 17 and 21) you can anticipate that in the process of re-broadcasting the signals, the weaker ones are only going to get 'worse' (although the stronger ones will pass through the system without any noticeable degradation).

David Lantz from TX was insistent that we try to marry both the vertical and horizontal signals into the system and transmit all 24 through the air. After seeing the problems we were having with the weaker/colder verticals in the 12 channel system, we were less than anxious to try his concept. But we did.

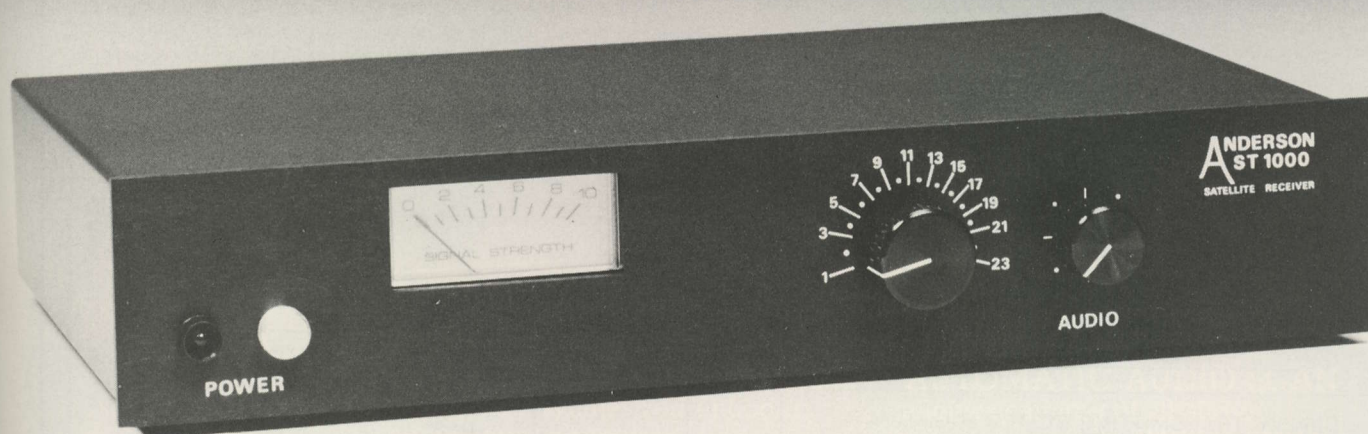
First we simply parked the LNA at 45 degrees (reference vertical and horizontal) and spilled all 24 channels into the TX down converter. Then we connected a TX-200 receiver to the down converter at the antenna site and tried to separate the signals. This is not total lunacy; the TX-200 receiver has been designed with a SAW filter IF that is 21.5 MHz wide. This is an on-purpose design consideration with the TX-200 since in the Pacific Northwest TX installs 24 channel satellite cable (master antenna Custom Television Network) systems every week using just this technique; see **CJR** for October 1983. However, it **works in the Pacific Northwest** because there is only a slight carrier difference level between the hottest signals (hot vertical side) and the coldest signals (cold horizontal side). On Provo, that difference is a whopping 6 dB in the normal situation. We learned something; even with a 21.5 MHz wide IF (which happens to be just wide enough to allow you to separate all 24 channels if the system is 'balanced' carrier to carrier, in level) you cannot properly separate the weak ones from the strong ones. But we didn't give up.

Then we went to a 20 foot dish where all but WTBS are totally noise free (above threshold) where we had separate LNAs operating on vertical and horizontal. We took the output from the two LNA lines and re-combined them into a single line using a two-way microwave splitter, connecting it up 'backwards' as a 'combiner.' Now we had one piece of cable with all 24 signals on it. This we then fed to the TX down converter. The results were virtually the same as with the 45 degree parked LNA; only the picture quality on the 'good ones' was improved. We still had a 6 dB carrier level difference between the hottest-hots and the coldest-colds, and that 6 dB difference was too much for the TX-200 to properly separate. We thought about balancing the lines, and installed some step attenuators in the vertical side line to bring its level down 3 dB. That helped a little but not as much as we hoped. Bottom line? **Stick to sending 12 channels through the air**, for now and if possible try to keep those 12 at about the same carrier level out of the LNA/down converter before you feed on into the re-broadcasting amplifier.

Tilt. Let's get back to that additional loss between a signal at 450 MHz sent through the air and a signal at 950 MHz sent through the air. Remember our short form table showing the loss difference for various distances. Uniformly, the loss at 950 MHz is around 7 dB (rounded off to the nearest whole dB) greater than the companion loss at 450 MHz for the same 'path length.' You will recall that cable also has higher losses at higher frequencies.

One way to compensate for this difference is to 'tilt' the output of the amplifier at the transmit end of the system. That is, raise the output level at the high end (950 MHz) by 7 dB, reference the output level at the low end (450 MHz). It happens that the Blonder Tongue MUB amplifier, perhaps the easiest-to-obtain box to 'play' with this concept, does have a built-in tilt control. And if you adjust it properly, you can 'tilt' the high end by about 5 dB; close to the theoretical 7 dB. This helps, but it is **not** the full answer because you also have tilt elsewhere in the system. Chances are you will not or cannot mount the transmit amplifier directly at the transmitting antenna (the MUB is 117 VAC powered and mounting it outside would require a weatherproof box), although that is the desirable point for it. Mounted at the **bottom** of the tower, you have 'tilt loss' in the cable connecting the MUB (or whatever amplifier you may use) to the transmit antenna. Ahead of it, you **also** have **tilt loss** between the output of the down converter and the input to the transmit amplifier/MUB. We'll run through the numbers

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The Anderson ST1000 satellite receivers enable truly low cost, simple, single and multiple television systems. These receivers are now available in attractive low profile housings with improved audio and video performance. Capabilities include:

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separately.

At the receive end, you may find (as we did) that there is a tilt built into the typical cat whisker/bow tie antenna; i.e. it has more gain in the low and middle portion of the spectrum than it does at the highest end. We tried to change this by 'pruning' the cat whiskers (cutting them slightly shorter), but found mixed results. You are really asking a great deal of a ten dollar consumer antenna when you expect it to have 'flat gain' from 450 to 950 MHz! Also at the receive end, you will have tilt in the cable connecting the antenna or pre-amplifier down to the TX-200 receiver.

So overall, between the transmit end hardware, the through the air losses, and the receive end hardware, you may have as much as **12 dB of 'tilt'** between the low end of the band (450 MHz) and the high end of the band (950 MHz). Somehow this requires compensation. Why?

If your signals at each RR site are strong enough that you are 'above FM threshold' in the worst case channel example (23 on vertical, 24 on horizontal), then you **may not** have to worry about the overall system tilt. **But**, if you are marginal in signal levels, you will 'lose' the higher end signals first. They will gradually be weaker as you tune up the band so that as you approach the high end they may be gone altogether or too weak to use.

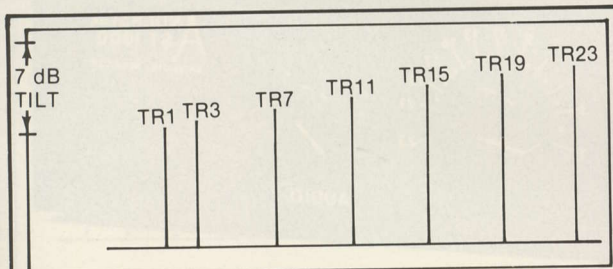
One solution is to build say 12 dB of tilt into the transmit end package; either by designing the transmitting amplifier so that it has 12

dB more output at 950 MHz than it does at 450 MHz, or, designing a transmitting antenna that has 12 dB more gain at 950 than at 450. We spoke with some people at Blonder Tongue and were told that 'yes, the MUB could be more severely tilted,' as requested. But it would be a special order item (or alternately, if you had the sweep equipment you could set out to do this yourself). However, let's suppose you wished to increase your power above the +40 dBmV level practical with an MUB or other commonly available broad banded UHF TV amplifier. Suppose you wanted to go to say **1 watt of transmitting power** (a 30 dB power increase from the MUB). Where would you start looking for such a box?

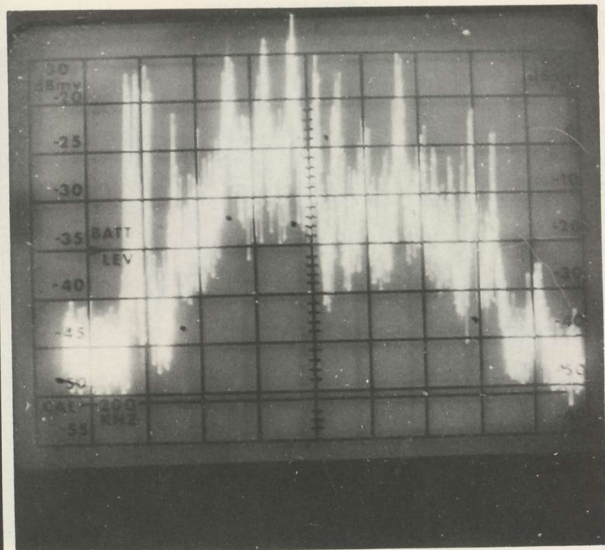
ENTER/ NSD, Inc.

We took our problem to **National Solidstate Development, Inc.** (10936 Portal Drive, Los Alamitos, Ca. 90720; 714/527-4896; Tom Litty). NSD manufactures a very wide line of solid state power amplifiers covering the region from below 50 MHz to over a GHz. They offer them in virtually every power level and powering configuration you can imagine. They have been marketing solid state power amps for quite some time and they sell worldwide.

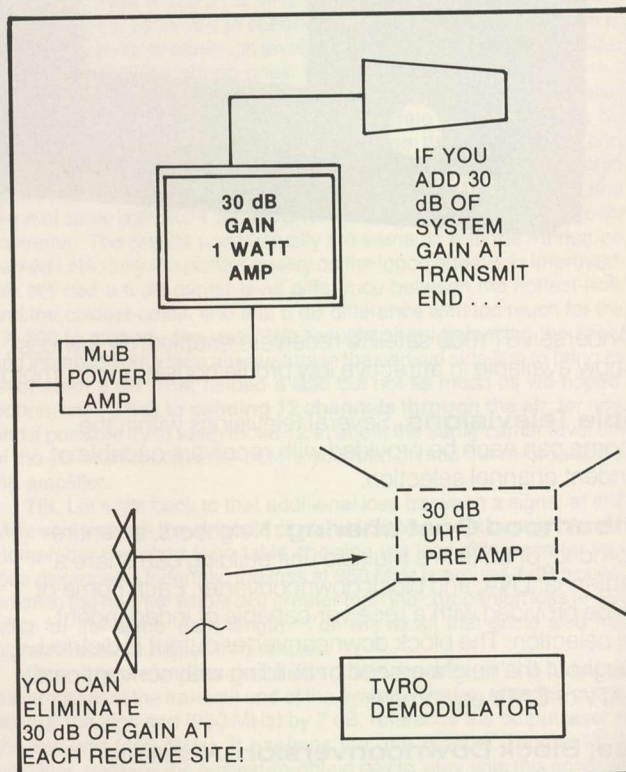
Our goal was to see a 1 watt, a 5 watt and a 10 watt broad banded power amplifier available which would be powered with a remote DC power supply using an extra cable to power the amplifier, separate from the RF cable connected to the power amp from the down converter. We felt the power amplifier should mount right **at the transmitting antenna** to minimize line losses (and tilt accumulation) in a long feedline. NSD agreed and is as we write this report working on just such a line of amplifiers.



IDEALLY, TRANSMITTING SYSTEM MIGHT HAVE 7 dB OF TILT BETWEEN TR1 AND 23 TO REFLECT HIGH PATH LOSSES AT 950 MHz END OF SPECTRUM



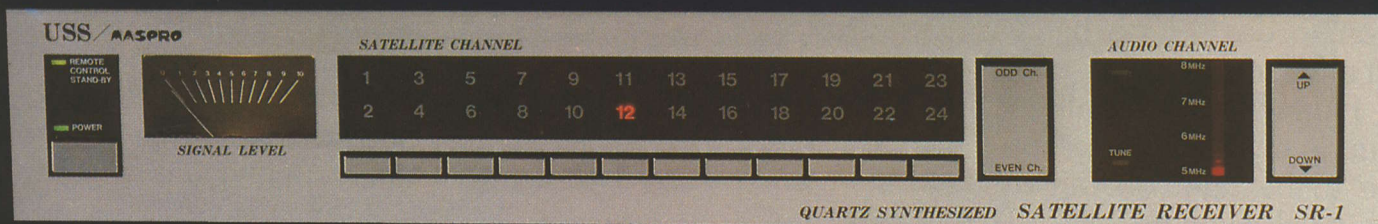
YES WE HAVE TILT! Plugging VSM-2 spectrum analyzer (see text) into test port on MUB amplifier we could see the amount of system tilt we had. Close-spaced carriers at far left are leakage into cables from ten watt AM transmitters operating at low end of 450 band. Higher frequencies are to right.



Remember that when we did our initial, example, system gain and loss calculations we found ourselves 20 dB shy in our example of enough 'system gain' to make the path work. We added a consumer type \$30 UHF pre-amplifier to get back our missing gain but noted that if you had 100 RR sites you would be spending \$3,000 for 'power make up' for 100 separate pre-amplifier boxes. That didn't seem like a practical way to design a system, and keeping 100 small UHF pre-amplifiers 'working' also didn't seem like a very appealing maintenance

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The Russians launched the first earth satellite back in 1957. They called it Sputnik. It excited the world and jarred America into response. Sometimes an external influence can cause positive results. It happened to us. America wasn't the first in space, but within a few years, no one could touch our Apollo moon program.

Remember the thrill when we heard, "The Eagle has landed?"

Man on the moon.

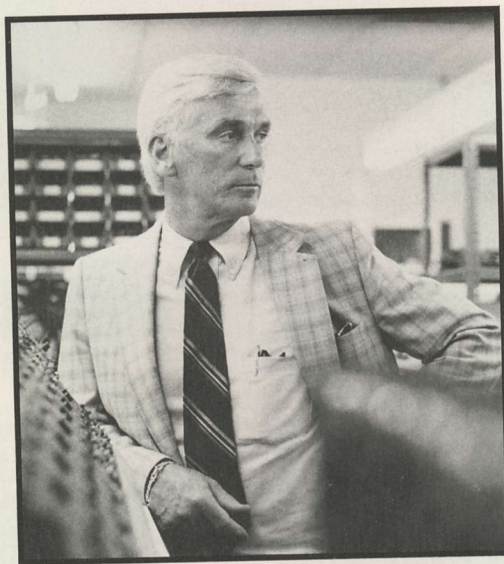
Once Neil Armstrong stood on the moon, things would never again be the same.

You could offer me anything in this world but if I had to give up my experiences in the Apollo moon program, I'd say, NO!

Since those days we have even broken through the external regions of the solar system.

What an age.

It's a wonderful feeling if you can write



Gene Cernan, Commander of Apollo XVII, who left man's last footprint on the moon.

"astronaut" on your resume—but it's not a skill that every company can use.

When you find a company that is dedicated to goals and standards that you hold dear—that's exciting!

Intersat is that kind of company. It's why I joined them. At Intersat, second-best won't do.

When satellite television became a big thing, everybody seemed to jump in fast. Dish antennas proliferated. All

sizes: Six feet, nine feet, ten feet.... Sort of like Sputnik.

At Intersat we were taking a closer look at all the possibilities. The people at Intersat reasoned that everything would depend upon the F.C.C.'s final decision regulating satellite spacing.

Intersat calculated that 2-degree satellite spacing would be the most likely decision.

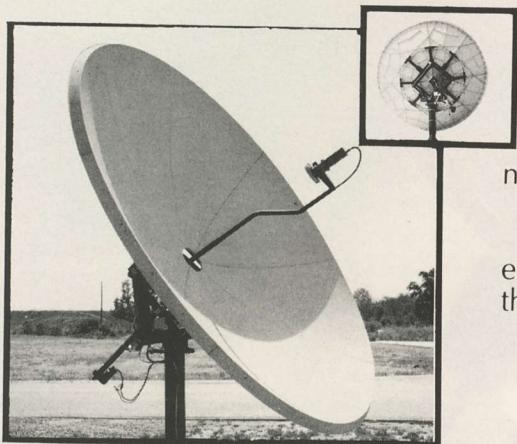
That's what happened on April 27, 1983.

Intersat was right.

Intersat had designed the system and the precision-engineered Challenger XI dish antenna to meet this decision.

Other companies may need to completely replace earlier antennas. Expensive.

BEAUTY AND THE BEST



*Challenger XI Antenna

So Intersat has developed the best satellite dish antenna — one that will deliver for you today and the future. That's only half the job.

They were also designing a receiver that would push everything else into yesterday. A micro-processor/receiver that has a bigger memory than most home computers.

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Great name . . . because it really is ingenious.



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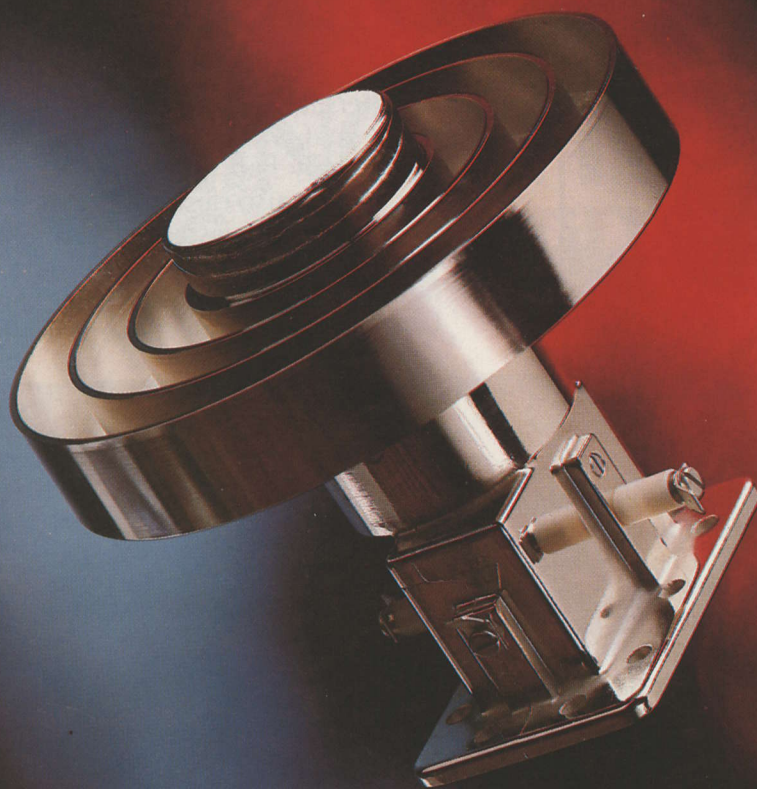
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SDS/ Continued from page 52

nance problem. Go into a bigger market, with perhaps 1,000 RR sites, and you were suddenly into full-time maintenance of small UHF TV pre-amps.

Given that we were trading dollars for dBs, it seemed like the right approach was to increase the dBs at the transmit antenna site, **one time**, rather than increasing the dBs at dozens or hundreds of individual receive sites.

MORE THAN 12 Channels/ Again

Satisfied that unless you were able to 'equalize' the hot and cold F3R transponders in levels that you were not going to make 24 channels go through the air together, happily, we then pondered how you might go about getting more than 12 channels into an SDS system and still keep the picture quality 'up.' There are, it turns out, at least two ways to do it.

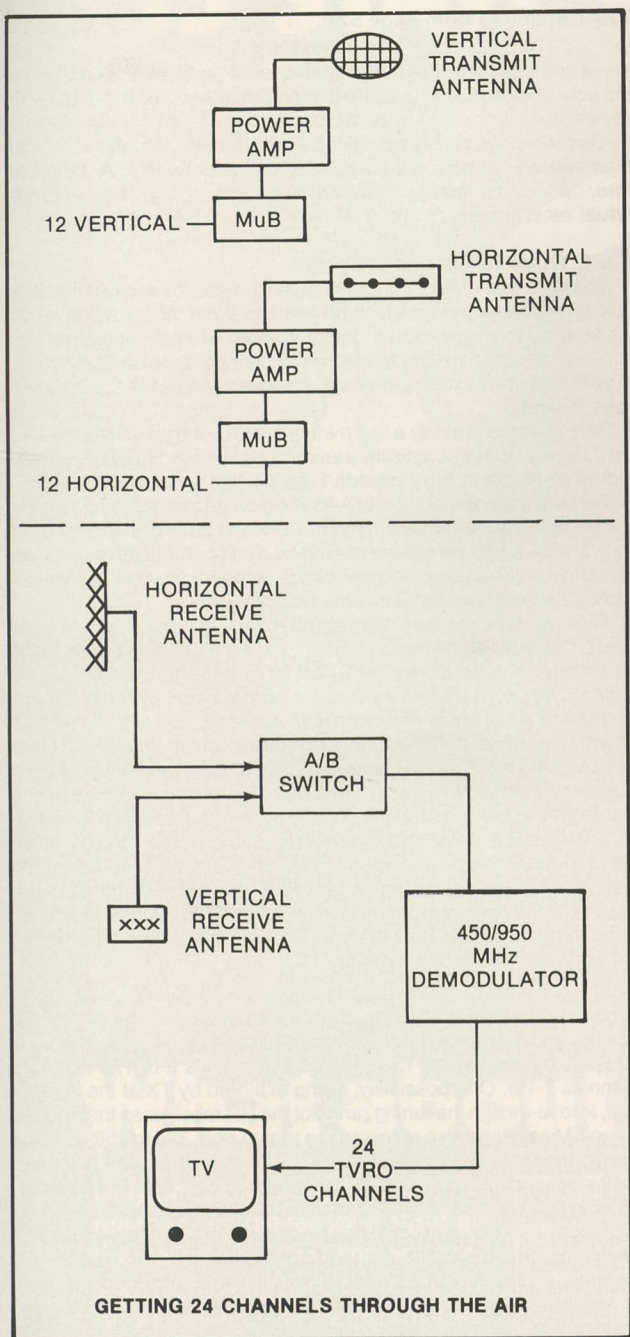
The first required only a few minutes of trial and error to verify. Our first clue was that the satellite transmits half of the channels vertical and half horizontal. **Why couldn't we do the same thing!**

First we took one of the cat whisker/bow tie antennas and simply watched the pictures while turning the antenna 90 degrees; over on its side. The pictures went away, telling us that we had sufficient 'isolation' with the cheap bow-tie antennas to be able to receive a separate set of 12 signals on the 'opposite' polarization.

Then we took the feed from another LNA and fed it into a nearly identical system at the transmit end; now we had 12 channels being fed through a down converter to an MUB amplifier and a transmit antenna; **horizontal**. And, we had the same thing being fed through an identical set of equipment, **vertical**. At the receive site we held the antenna horizontal and watched 12 channels and then flipped it on its side and watched 12 other channels. Twenty four in all! Since we can't expect most people to flip their antennas over, we then installed a pair of antennas and duplicated the receive system a second time, installing a UHF rated 'A/B' switch to select ahead of the TX-200 which antenna system was connected to the TX-200. It worked. Instant 24 channels. And instant 'tiering' of service. A 'customer' wants 12 channels? Fine; they get a **single** receive antenna. They want 24 channels, for more bucks? Fine, now they get **two** receive antenna (systems) and an 'A/B' switch. Pretty neat.

There is an alternate approach, suggested by David Lantz. As he points out, in a normal VHF terrestrial TV situation with off-air VHF TV signals, you have the frequency band between 54 and 216 MHz occupied by channels 2-13 (54 to 88 is channels 2-6; 174 to 216 is channels 7-13). One possibility, being explored by TX at the present time, is to re-design the tuning range of the RR receiver so that it tunes (as an FM satellite video receiver) the region from 220 to 450 as 'band 1' and the region 450 to 950 as 'band 2.' We already know that we can fit 12 single polarization signals between 450 and 950; but between 220 and 450 we have 230 MHz of spectrum space as well. Using 40 MHz wide channels, you could down convert TVRO signals spaced as they come off the satellite and add an additional 5 or 6 satellite TV channels in this region as well. If you did this, and had the right off-satellite mix to fit the bandwidth available, you could then rebroadcast a separate band in the 220/450 region from a second satellite fed by a second dish and LNA plus down converter. If you employed the two polarization trick we did here on Provo, the 5 to 6 channels could become ten additional channels with ease; giving you a total of 10 plus 24 or **34 total** SDS distributed off-satellite channels.

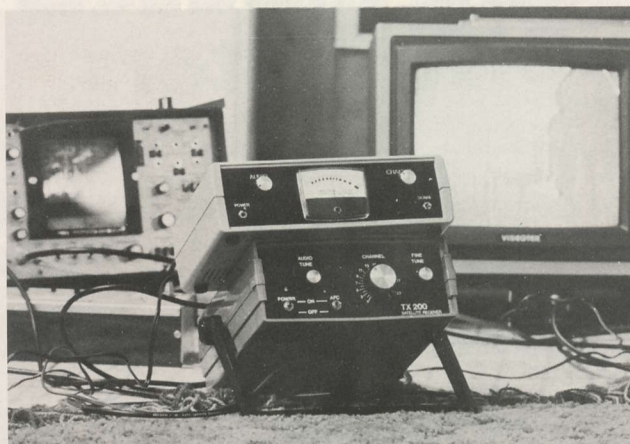
Or, as Lantz points out, you could take the satellite band 'apart' and mix at the headend/transmission point signals from different satellites. Suppose you wanted to eliminate transponders 1 and 3 from the vertical side of F3R and substitute a pair of signals such as WOR and SelecTV from W5. First you would select a filter from **Microwave Filter Company** designed to 'stop-band' transponders 1 and 3 from getting through the F3R antenna system. Now you would have that portion of the spectrum 'clean' in your rebroadcast system. Then you would take a separate antenna from W5 and down convert WOR and SelecTV to replace transponders 1 and 3 in your original F3R mix. Now you have 12 channels again, but from **two** birds. Using stop-band filters to eliminate those you don't want, and down converter mixing to add back those you do want, the mix and match choices



are almost infinite. But, the costs increase as the system becomes more complex and through it all you must maintain a balanced carrier level (carrier to carrier) through the full system to the input to the receiver at the remote receiving (RR) site(s).

ALTERNATE Receivers

Our tests were conducted using TX Engineering equipment, for the most part. However, we also had on hand a set of the **Anderson Scientific** receivers which we used for 'A'/'B' comparisons. The primary difference between the Anderson products and the TX products is the approach each takes to the IF selectivity. TX, as previously noted, employs a 21.5 MHz wide SAW filter in the IF. This creates razor sharp adjacent channel selectivity as you tune from transponder to transponder. The Anderson utilizes a more conventional stagger tuned IF filter arrangement and it has less selectivity between channels.



'A'/'T' TESTING/ We did testing back and forth between an Anderson Scientific receiver and the TX-200 receiver on the 2.5 mile SDS feed.

In the real world, as long as you are running 12 channels through the system (and not attempting to run 24) we found mixed 'better-than' and 'worse-than' results between the two units. The TX units displayed superior audio, and the color was of a higher quality. The Anderson units, on the other hand, seemed to demonstrate superior sensitivity when we were fooling around with purposefully weakened signals. Additional units of a similar 450-950 MHz block down conversion design are manufactured and sold by **LOCOM** and **Janeil**. Neither of these units has been tested on Provo to date.

All of the equipment in this limited corner of the industry (utilizing 450-950 MHz as a block down conversion IF region) seems to be in a considerable state of design flux. Production changes in the design and the major component parts used in the Anderson, Locom and Janeil versions seem to shift monthly. Each is wrestling for a competitive edge in the mass market home TVRO field, while TX is staying pretty much out of that fray and concentrating on the multiple outlet condo and trailer home market. Our suggestion is that anyone thinking about experimentation in this area be prepared to field-try **all** of the available units **before** making a buying decision.

TEST Equipment

We have mentioned several times that the whole system is number and dB conscious. You cannot simply plug everything together and **hope** it works. Judicious use of signal pads, adjustment of tilt controls, and analyzing of the component parts is mandatory or you won't get signals across the ground between points 'A' and 'B.'

Many TVRO installers have pressed into service a CATV type of field strength meter since such a meter can be made to work, after a fashion, in reading FM carrier levels in the 70 MHz IF range of most of the common TVRO receivers. However, a field strength meter of this type is an **AM detector device** and at best it will read only relative levels from an **FM carrier**. In this system you are concerned that the signals from 450 to 950 are 'level' or tilted, as required. Little things like F connectors and pieces of jumper cable and signal pads, used in a complete system, may function fine at 450 or 700 MHz but they can fail you at 900 MHz. **You have to identify and replace such parts**, or make the right adjustments, to get the system to function properly.

There is really no substitute for having a minimal type of portable **spectrum analyzer**; a unit that allows you to display with some accuracy all of the (FM) carriers you are processing and transmitting. In our case we pressed a **Jerrold/Texscan VSM-2** spectrum analyzer into service so that we could **see**, measure and work with the signals in the 450-950 MHz range as we set up and adjusted the system. A spectrum analyzer such as this is **mandatory** for anyone doing serious work in this area.

EQUIPMENT Interface Problems

The UHF TV band actually begins at 470 MHz and it climbs to 890 MHz. This is important to know since you are using **all** of this band,

and then some, in working with block down conversion systems operating between 450 and 950 MHz.

Little devices such as line splitters, connectors, switchable attenuation pads and fixed attenuation pads are often poor in performance above 900 MHz. You can **lose** the top two or three channels in a system such as this simply because someplace in the line you have a small unit which refuses to pass signal above say 850 or 900 MHz. David Lantz reports that he has spent weeks, cumulatively, analyzing the various 'off-the-shelf' small bits and pieces that his firm uses on a daily basis in designing and installing cable distribution systems in this region. A full list of parts that do and don't work, either as advertised, or above 890 MHz, would fill a page. Suffice to say that if you find your own system having 'through-put' problems on the **high end** of the band, and the transition seems to be rapid from good pictures on say transponder 17 or 19 to no pictures on 19/21/23, suspect a device in the line that cuts off **before** 950 MHz rather than suspecting the more gradual 'tilt' loss problem.

BUT/ Is It Legal???

Back in the beginning we noted that the SDS system 'broadcasts' through the air. And that while the system described here uses only a MATV type 'power amplifier' with power levels exceedingly low (under 1/1000th of a watt), it **is** 'broadcasting' **nonetheless**.

FCC rules preclude broadcasting, even this type of low-power broadcasting, without a license. That's not the bad news. Which is?

The FCC only grants licenses for 'broadcasting' when you have a broadcast application or system which fits a 'format' which they **will** license. In other words, you can get a license to broadcast a **single** channel at a time, using **AM** techniques. But there is no 'service' definition in the FCC rules which even comes close to 'wideband FM re-broadcast' of satellite TV signals. What we are discussing here does not fit any existing FCC 'service' and because of that no license would be granted.

Does that mean that there is no commercial future for SDS in the United States? No, not quite. It would be possible to request a license under the 'Developmental Rules' to **experiment** with the development of a system like this. Such developmental licenses are normally granted for a short period of time (one year or less) with no guarantee that they will be renewed. They are also typically granted with the understanding that no commercial use of the service can be attempted during the 'experimental/developmental phase' of the license. Such a license would allow you to experiment with the system, develop the hardware, and **then** return to the Commission in a year or so with the results of your experimentation. You could also petition them, at **that** time, to create a brand new type of transmission service for which licenses could and would be granted. The whole cycle would be two to three years or more, but in the process you would be a part of the creation of what might turn out to be a dynamic, new industry.

There **are** several such systems now operational. The pioneer in this field is **Russ Walsh of Cablesat Corporation** in Canada (****). Walsh, using Anderson Scientific equipment, has a number of these systems operational in various rural British Columbia locations. Walsh feels strongly that the market for this type of system is gigantic, worldwide, and he has conducted various studies to support that view. One of his pet studies relates the cost of his chosen (Anderson Scientific) receiver products to the group cost of the entire system. Walsh has found that if a system can serve as many as 50 homes, that there is ample justification for 'doing the headend right.' He points out that if there are a few noisy transponders on the satellite chosen, if you take 50 homes and dedicate say \$200 per home towards that home's share of a suitable **high grade antenna**, you have \$10,000 to work with for the antenna to clean up noisy channels. Now add to that a 'retail price' in the \$300 region for the Anderson Scientific receiver and another \$100 per home for the receive antenna systems at the home and installation, and you have each of 50 homes investing around \$600 in a very **high** quality system. If the system sticks to the single polarization, you are delivering 12 channels for \$50 per channel which, he feels, is a very reasonable per-home cost for 12 channels of

television in a rural, remote area. Walsh's Cablesat Corporation is currently working on a line of 1, 10 and 20 watt power amplifiers for the service, as he also identifies the individual home signal pre-amplifiers as an unnecessary item for all but 'fringe area' viewers. The father of the low-cost block down conversion systems, **Keith Anderson**, meanwhile, is reported to be close to production capabilities with a far better receiver for this reception service. Keith feels that if the FM 'threshold' for the home (RR) site receiver can be pushed to -30 dBmV or so, thereby giving back 20 dB of gain to the system for use elsewhere, that he will be able to expand the service areas for such systems dramatically.

His logic is that if you can reach 5 miles with an **existing** receiver package that requires a -10 dBmV input signal level to produce a high quality picture, by shoving that threshold down to -30 dBmV you pick up 20 dB of coverage range for the same quality of signal. If you will recall the system equations, each time you double the distance you increase the 'path loss' by 6 dB. So if a particular system is performing adequately to 5 miles with a -10 dBmV receiver threshold, you could extend the path (assuming line of sight) from 5 to more than 40 miles by reducing the receiver threshold to -30 dBmV. (**How?** You add **6 dB** of path loss each time the path length **doubles**; you have 20 dB additional possible path loss with the improved receiver. From 5 to 10 miles costs you 6 dB, from 10 to 20 miles costs you another 6 dB and from 20 to 40 adds a final 6 dB; 18 of the 20 you picked up by improving the receiver's FM threshold.)

Are there systems operating **within** the United States, unlicensed? There are several, typically in rural areas, often in valley locations where the very weak signals don't get beyond the confines of the valley floor. Our experience with attempting to operate the system in an area with one or more strong UHF stations already on the air is worth noting, however. WIV presently operates a trio of AM TV channels immediately **adjacent** to the 450-950 MHz band. Our ten watt output carriers never seemed very powerful to us, but compared to the less than 1/1000th of a watt for the FM carriers, these ten watters are very potent! We found that we could not utilize transponder 1 with the FM system when we were operating a ten watt AM signal within a few MHz of the transponder 1 carrier frequency. That was no big surprise. What did surprise us was to find that our second harmonic signal, never before considered objectionable, from our ten watt transmitters was sufficiently strong to also wipe out the very top end of the 450-950 MHz band. This happens when the ten watt transmitter allows a certain amount of signal leakage to get into the air at **twice** its own operating frequency. We finally went back and measured it, and found that when we have ten watts at the **primary** output frequency, we were 'leaking' and radiating around **1/10th** of a watt at twice the operating frequency. When that 1/10th of a watt signal appears within the high end of the 450-950 band, it blots out or covers up the far weaker FM modulated signals. Result? We **lost** 21 and 23 as well as TR1 on the system. The answer was to improve the filtering on the below-450 ten watt transmitters.

However, it also taught us something about attempting to 'share' the same frequency spectrum with terrestrial **AM and** broadband FM. You will lose one or two channels on your broadband FM system if you have reasonably strong AM terrestrial TV present in the same band. There is no interference **to** the AM service (for a number of reasons) but the strong AM carrier simply will not allow you to tune **through** it for the wideband FM information present.

DYNAMIC Interest

Interest in this type of shared service is in its infancy but growing rapidly. On an 'experimental' basis anyone with a 450-950 block down conversion system can connect the output to a suitable amplifier (Blonder Tongue MUB, Winegard 4300) and an inexpensive UHF TV antenna and **transmit** the full spectrum over a distance of a quarter of a mile or so; connecting a block down conversion demodulator and a second low cost UHF antenna to a TV at the opposite end of the system. The addition of a stage or two of UHF TV pre-amplification at the receive site(s) will strengthen the service and increase the range.

Anyone seriously considering such a system is urged to contact both TX Engineering and Cablesat Corporation for their assistance. Cablesat, in particular, has produced a very useful applications manual which will save the first-timer-experimenter days and possibly

****/ CSC-Cablesat Corporation, #207, 19585-56th Av., RR 3, Surry, B.C. V3S 4N9 Canada; 604/533-4757.

weeks of fruitless trial and error.

The system does work, it is low in cost, and it has universal applications which none of us have even thought of yet. Given improvements in receiver designs, new solidstate antenna mounted 1

watt and higher power broadband transmitting amplifiers, the field still has plenty of room for growth and development. It is an exciting concept offering yet another 'distribution scenario' to the seller of TVRO hardware.

THE ROOTS OF TVRO (Part 10)

ABOUT THIS SERIES/ As perhaps the first phase of the American experiment in DBS slowly draws to a close and a new era gets underway, this series looks back at the period in American television history when the first television stations were coming on the air and the present television networks were forming. One of the FCC's 'better ideas' was to expand the number of potential channels available. They did this by opening up the UHF television band in 1952/3. As we rejoin the series, in progress, we see what the first UHF stations on the air were facing and how they had to cope with a very difficult economic situation.

So It Began

To set the proper perspective for the immediate period *after* the freeze lifted, one has to imagine a nation swept with the frenzy that "*Every town in the country was going to have television soon*"! First there were rumors that the whole nation would see the World Series, and then it was going to be the Rose Bowl.

So much had been written about the wonders of television that it was no wonder at all that people, firms, radio broadcasters, newspapers, and corporate giants were standing in line just to file their applications!

Virtually anyone with a few bucks of cash and a few more of credit was convinced he would *soon be a millionaire*; the *license to riches* was the FCC authorization to build a television station.

The allocation table set up the VHF-UHF program pretty much as we still have it today. Many small towns were given allocations because the *allocation table* created allowed channels to fall *near* the towns. Ely, Nevada, for example (1970-74 population = 4176), received VHF channels 3 and 6.

Nationwide, the VHF channels were limited. In 1952, UHF channels were *for all practical purposes* "unlimited." The smart money figured a VHF license was *more* valuable than a UHF license, so it filed there. However, few VHF channels had *only a single applicant*, and they would therefore require FCC comparative hearings to determine who would get the coveted permission to build and operate.

To some *not-so-smart* money, where VHF and UHF channels were allocated to the *same* community, the UHF channel seemed the fast way to get on the air. Simply because there was less likelihood that you, as an applicant, would have a competitive applicant there. So, many who would have *preferred* a VHF channel filed for the UHF, simply because they expected no competition and hoped their permission to operate would come quickly.

The Commission set up to *speed* applications through. It is entirely possible that many of the early applicants were stamped "approved" by the Commission with no real investigation of the applications or the financial qualifications of the applicants. As the results would show, *too quickly* for some of the applicants, many were in truth *not qualified* for the financial drain

which would follow. And short of capital, they would start big, and die soon. But that is getting ahead of our story.

The first grants were to places like Denver, Portland, Springfield-Holyoke, Flint, New Britain, New Bedford, York, Youngstown, and Bridgeport. Denver had *three* applications approved quickly: channels 2, 9, and 26. Portland had a single channel approved, channel 27. Channels 55 and 61 went to Springfield-Holyoke; Youngstown received channels 73 and 27; channel 28 was approved for Flint; New Britain-channel 30; New Bedford-channel 28; and York-channels 49 and 43. New Britain, where RCA conducted UHF tests for many years, received channel 43.

Meanwhile, some *cities* showed displeasure with their assignment of channels. Pittsburgh was notable because radio station WWSW filed an action in the U.S. Court of Appeals, Third Circuit, asking the court to review the Commission's table of assignments. The station sought a third VHF channel allocation for Pittsburgh, noting that "*Pittsburgh had been allocated only two commercial VHF channels*" (plus three UHF commercial channels). "If market area population is the criteria the FCC went by," the appeal said, "there are twenty-seven smaller markets than Pittsburgh which received three or four commercial VHF channel assignments." In other markets, others were upset with the Commission and filed similar appeals. Radio stations WLOA-Bradock, Pa., KVOL-Lafayette, La., WISC-Madison, Wis., and WLAN-Lancaster, Pa., all filed in the U.S. Court of Appeals in Washington, citing local (to themselves) allocation situa-

tions which they did not like.

But in spite of these problems, most of the industry was "upbeat" at this time. Commission sources revealed that "over five hundred applications for new stations had been filed" within ninety days of the lifting of the freeze.

To handle the influx of applications, the Commission set up a priority system. Lists were prepared and released by the Commission, ranking cities where *competitive applications* would be heard first, second, and so on. The list riled two FCC Commissioners. The top three cities on the list were Denver, Canton, and Portland. Commissioner Bartley dissented in the issuance of the list and said:

"The Commission should consider making additional new grants to those cities where the greatest need exists. Denver does not need three additional channels (it received three immediately after the freeze lifted). It is foolish to consider three new grants for Denver when St. Louis only has a single outlet and it is a city twice the size of Denver."

There were many fault-finders berating the Commission in those days. To offset the bad press they were receiving, Commissioners Walker, Sterling, and Webster mounted the speaking tour and began to defend the allocations table.

Commissioner Hyde joined the trio at the Virginia Association.

"Unless we utilize the chosen block assignment plan, there would be a chain reaction of applications and hearings. It is conceivable that one applicant for channel 9 in Pittsburgh would eventually involve a giant hearing that would take in every applicant for a high-band station from South Carolina to Nebraska, and east to the East Coast as far north as the Canadian Border."

The Commission was purely *selling*

TERRESTRIAL INTERFERENCE.



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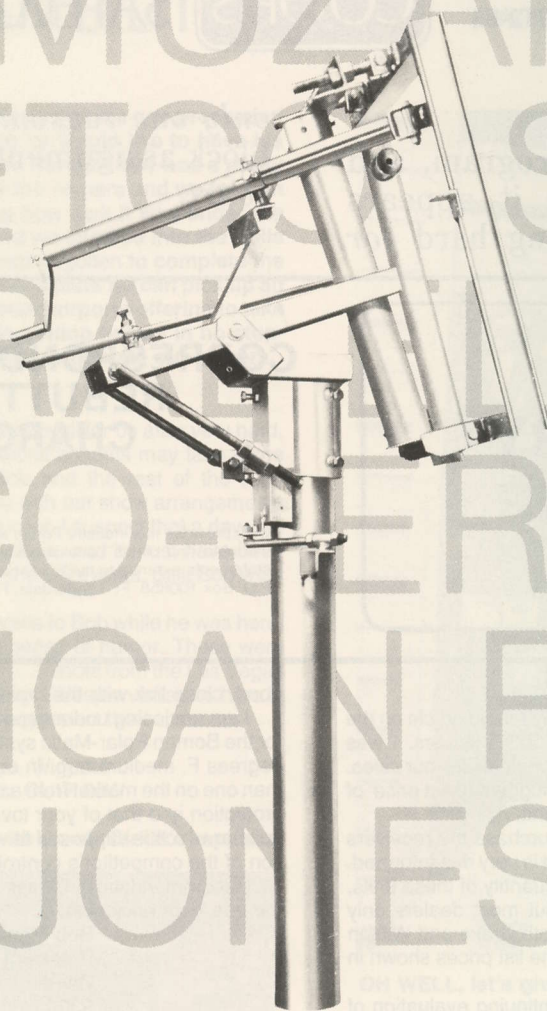
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*South
River*

ROOTS/ Continued from page 61

hard for the allocations program, and in historical perspective, it appears that they had to be selling hard for

only one reason: they feared that the block assignment plan might end up in court.

ROOTS will continue in CSD.

INDUSTRY AT LARGE

CORRESPONDENCE, NOTES, REBUTTALS AND CHARGES . . .

CSD provides this industry Forum with the understanding that opinions, thoughts and "facts" published are from the writers, no liability for statements extends to the publishers. Address letters to CSD/Industry, P.O. Box 100858, Ft. Lauderdale, FL 33310.

WHAT IS THE Real Price?

In the October issue of **Orbit Magazine**, they ran an article on the Drake ESR-224 receiver and the Wilson Y-1000 receivers. I was pleased because I sell both units and I felt this would assist our sales. However, at the end of the article Orbit lists a 'suggested list price' of \$495 for the Drake and \$895 for the Y-1000 unit.

Now, either the distributors from whom I purchase my receivers are gouging me or the writer for **Orbit Magazine** is very mis-informed. I suspect that if a dealer did purchase a large quantity of these units, he might be able to get the prices shown. But most dealers only purchase one or two units at a time. I called both Drake and Wilson and neither firm would or could tell me where the list prices shown in **Orbit** same from.

I would like to suggest that **CSD**, in its continuing evaluation of products on the market, do an evaluation on **Orbit Magazine**! Such an evaluation should show all of the good and bad features of the publication. To save space, I would suggest you get to the bottom line and note that it costs \$4 an issue when it should have a list price of perhaps \$1.95. I base this on my subscription to the computer magazine **BYTE** which is three times as thick and which has a list price of \$2.95!

What these two reviews in **Orbit** have done for me is to force me to stop handling both products. **Orbit** is widely read by the consumers, to whom it is directed. By having the suggested list prices shown printed, the magazine has made it impossible for me to sell these units and make a profit in small quantities. I will no longer offer nor show any of my customers **Orbit Magazine**. I have begun to actively push **Satellite TV Week** because they stay out of the business of satellite equipment and they are not in there providing information to the consumer which I consider competitive to my dealer activities. Thank you for allowing me to let off steam on this issue.

Jerry Brandt
LaGrange Satellite Systems
P.O. Box 16
LaGrange, Mo. 63448

In a highly fluid and young industry such as ours, pricing of equipment in a publication intended for retail trade or consumer use is at best difficult. Being sure of a nationally suggested list price is mandatory if you publish any numbers. We believe consumers have a right to be informed, especially on how equipment performs. But, as an observation, not all of the reviews we have read in **Orbit** seem totally factual nor complete. Perhaps they are using 'equipment reviews' as an enticement to attract advertising. If that is the case, the reviews are totally worthless even to the consumer since he gets a biased view of the equipment, carefully worded to reflect the publisher's concern that he stay on the good side of the potential advertiser.

GUARANTEED NOT TO Melt

As usual I enjoyed reading **CSD**; it is always a motivation to keep a

good, close link with the rapid industry movement.

I am enclosing under separate cover a sample of our new control for the Boman Polar-Matic system which has been oven tested to 400 degrees F, medium rare. In our opinion, it is slightly less dangerous than one on the market from a competitor. I am also enclosing for your protection and that of your lovely family a Fyr-Fyter brand fire extinguisher which is supposed to work properly when aimed in the direction of the competitor's control that "has a tendency to melt down."

Recommendation: Please replace my competitor's control with the one I am enclosing!

Bob Maniaci
President
Boman Industries
9300 Hall Road
Downey, Ca. 90241

Bob's reference is to a report appearing in the September issue of **CSD** where we noted that a popular brand of polarization control device went into a heat-up and melt-down state on the dresser in Coop's bedroom. We are pleased to report that since replacing the competitor's control with a Boman control there has been no repeat of the melt-down incident. We have also installed the Fyr-Fyter extinguisher adjacent to the satellite viewing position 'just in case.' Now if we can keep it from 'going off' whenever we happen to pass by the Playboy Channel, we'll have all of our major problems solved.

As an aside, during our visit to Microwave Specialty Corporation in October, to prepare the feed analysis report found in this issue of **CSD**, we stopped briefly in Los Angeles with fellow traveler Tom Harrington to have dinner with Maniaci at his Downey home. We had bet Harrington that Maniaci would pick us up at the LA airport in his Rolls Royce shown in the Boman advertising in October and November. Just as we stepped out of the terminal we saw the tail end of a Rolls bearing the license plate BOMAN 9 rounding the corner away from us. We knew in five to seven minutes time he would return. So we set our luggage down and waited. Ten minutes went by and no Maniaci. Then we looked down behind the taxis and saw the Rolls stopped in the taxi lane. Maniaci, recognizable from the back, was arguing with a policeman who had his ticket book out and poised in the classic ticket writing position. We grabbed our luggage and ran towards Bob and the cop.

About twenty feet away we heard the policeman say, "That's too bad buddy, I have always wanted to give a ticket to a Rolls Royce and this is MY chance!". Whereupon we reached over our shoulder into a bouncing camera bag and pulled out our camera and said in an equally loud voice, "Gee whiz, I have always wanted to take a picture of a Rolls Royce owner getting a parking ticket!".

Maniaci spun around and greeted us and the cop proceeded to start writing. I asked the cop how he would like to have his picture in a 'national magazine' and he thought that was a pretty neat idea. He and Maniaci posed for the camera and we took an awful set of two pictures, forgetting how dark it was under the roofline. Everybody shook hands and we climbed into the Rolls and took off. The cop, meanwhile, had forgotten to complete the ticket for Maniaci's Rolls. Harrington suggests we can pick up an extra few bucks a day wandering around airports offering to take 'national magazine pictures' of people getting tickets in no stopping zones. Maniaci suggests we learn to operate our camera.

MESSAGE From Birkill

The Birmingham (England) show went well for us after very hard, preparatory work although the commercial benefits may take some time to show. It was good to see Bob and the rest of the (US) contingent, though again I was so busy with our show arrangements that I missed the opportunity for a long chat. I suspect that a day was more than enough time to take in the show, and it must have been disappointing for those accustomed to the US events. Still, Bob went expecting to be disappointed!

I intended to show the enclosed photos to Bob while he was here, thinking that they might appeal to his sense of humor. These were inspired by Bob's CSD "Yes . . . that is . . ." shots from the Las Vegas STTI show and were taken when Norman Gillaspie visited us here in England in May. My wife Carole has suggested the captions.

Steve Birkill
Stacknedge Lodge, Wigpool
Mitcheldean, Glos. GL17 0JW
England

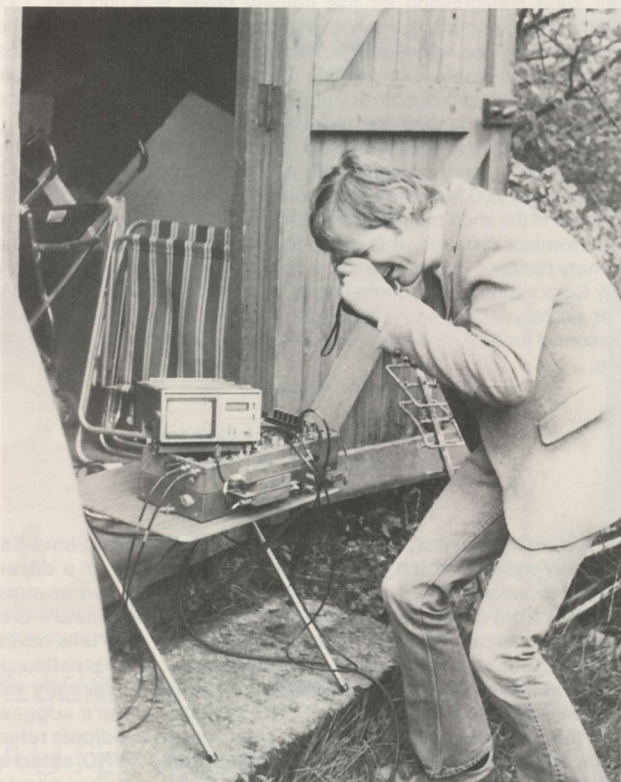
And the photos of Mr. Gillaspie with Carole Birkill's captions.



RUSSIAN TV on THAT? YOU ARE FOOLING ME!



OH WELL, let's give it a try.



HELL, IT WORKS (out with Pentax). THEY'LL NEVER believe this in California!

THE OTHER SIDE Of The MSC Test Range

Very much enjoyed the October '83 issue of **CSD** and the article on Antenna Testing/ Part One. While the article is very informative, a few errors did creep in and should be corrected.

First of all, I founded **MSC** in May of 1969. Thus **MSC** is 15 years old, not three decades as suggested in the report. Carl Grindle became affiliated with Microwave Specialty Corporation in approximately 1974 as an investor. He became active in the company management as its President in January of 1981.

I agree with Carl there is no way to evaluate an antenna except on a suitable test range. You spent quite a bit of time describing the **MSC** range, which I designed, and I thank you for the compliments. However, they must be having some problems with the range since when we did a field probe or sweep we generally accepted no more than ± 0.25 dB as a variation for a clean antenna test range.

Finally, and most importantly, the basis for gain measurements in my 30 years in the antenna field has been **isotropic** references. Only ham operators and a few early antennas were referenced to dipoles. The term dBi or dB with respect to the isotropic antenna is well established in the industry, as is dBd (dB reference a dipole). Of all of the antenna engineers that I know, if you mention the **gain** of an antenna without qualifying it, it is automatically understood to be dBi. Additionally, the gain of the 'standard gain horn' is determined primarily by calculation from its physical measurements or dimensions. The microwave standard gain antenna, as the horn is properly called, is an antenna whose gain is primarily determined through mathematical calculation. This calculation can then be verified to be true gain by measurement techniques. The most common measurement techniques for verifying gain of a standard antenna are (1) compare it against another standard, or (b) do a three antenna substitution test. In comparing it to another antenna, one has to determine the gain of the 'other' antenna someplace. It all boils down to the 'three antenna substitution test,' the details of which are beyond the intent of this letter.

As a side note, **Antenna Technology Corporation** has just completed installation of our own primary test range. It is 150 feet high, to get over the obstructions that might be encountered on the ground. Our short configuration for this primary range is 4,000 feet. Our intermediate length is 1.2 miles and our long range is 6 miles. The range is equipped with Scientific Atlanta and other modern antenna recording equipment. Our antenna turntable was designed and built by **ATC**. It is a hydro electric turntable capable of handling an antenna up to ten meters in diameter weighing up to 20,000 pounds.

We also have an elevated short range, which is 50 feet high. This short range is used primarily with a source tower 10 feet away, a source tower 200 feet away and another 600 feet away. The principal purpose of the short range is for measuring small aperture antennas at a convenient distance. It is ideal, for example, for determining the primary radiation characteristics of feed antennas. **Antenna Technology Corporation** is also marketing its antenna test range capabilities. Our primary test range, using the 150 foot tower, is rented with personnel for \$1500 per day while use of the short range is \$1200 per day.

Eugene P. Augustin
President
Antenna Technology Corporation
895 Central Florida Parkway
Orlando, Fl. 32809

ATC is the creator, by Augustin, of the well known Simul-Sat antenna system which allows reception from two or a dozen satellites across the Clarke orbit belt by mounting two or more feeds in front of the 'banana shaped' dish. We were aware that Augustin started MSC, as those working at the firm take some pride in that fact and remark on it frequently. The question of which standard to use, as a standard, dBi or dBd, apparently will not be 'legislated' in the home TVRO industry. Gene's suggestion that only 'Ham radio operators' reference to the dipole reference may be well taken; the first serious home TVRO antenna work was done by a chap named Tony Bickel, another named Oliver Swan and a third named Taylor Howard. It is probably more than a coincidence that all three had Ham radio backgrounds.

Perhaps for that reason the home TVRO industry has maintained as its primary reference 'standard' the dipole or dBd notation. We all try to leave a little bit behind, wherever we pass.

ATC's new antenna test range was an excellent 'side tour' for those in Orlando this past month at the **SPACE** show; too bad more were not aware that it was nearby. However, for antenna OEMs in the east, the \$1500/\$1200 per day rate is in line with others on the west coast and antenna suppliers who have failed to get their products 'certified' on a range because of the west coast travel distance now have another option. You can spend a few days in San Diego, or Orlando; neither are bad choices when the snow is flying, and it is all deductible. More important, you might learn something about your product and improve its market-ability.

Augustin failed to mention that he also had a hand in the first design of a polarization rotation device for switching between vertical and horizontally polarized satellite signals. For those interested in the 'heritage' of this system and device, now used so commonly in our industry, see 'TVRO Feeds' here this month.

UPDATE From George

As you are probably aware, I have taken 'Sat-Scene' off of the air. When I moved to Westar IV and Thursday play-days the audience did not follow (inspite of the good efforts of **CSD** and **Channel Guide**). It just would not be fair to the sponsors to continue the show with space on F3R so insecure. I am trying to get everyone to pay their bills so that I can pay mine! By the way, I never took or received a cent of salary for the program but from my experiences and opportunities to meet people, I guess I did 'profit' from the show. My thanks to **Coop** and **CSD** for the help and support and interest.

Recently Roice Krueger and I went over to Santa Clara to make a pitch to Dexcel for their distributorship in the Intermountain West. As a further symptom of the maturing of this industry, Gould has decided that they wanted no more than seven or eight exclusive distributors for their product throughout the country. Well, I had not made a major pitch for something I wanted in several years, but some of the old 'fire' was still there and by golly, we got it! Subsequently Roice has decided to leave the TVRO biz and return to his first love — motivational training. We will sure miss Krueg as he is a capable and talented person, but management was not his cup of tea. At any rate, I now find myself running the Dexcel distribution bash in our part of the country. It is called "**MountainWest Satellite Distributing, Inc.**" and it is a product which I can support without reservation inasmuch as I freely chose Dexcel for 'Chateau Mitchell' a long time ago. Conditions of the Gould/Dexcel deal include complete separation from Satellite TV Specialists and that MountainWest should not sell to the infamous 'Lady J.' As you know, it ain't hard for me to be as independent as hell and it took all of two hours for 'Lady J.' to find a new source. By the way, I believe you would applaud Dexcel's motive (albeit a selfish one) as this is their attempt to put some price integrity into our infant industry. It sure does get frustrating selling profit at less than a profit!

George Mitchell
MountainWest Satellite Dist., Inc.
3467 West 1820 South
Salt Lake City, Ut. 84104

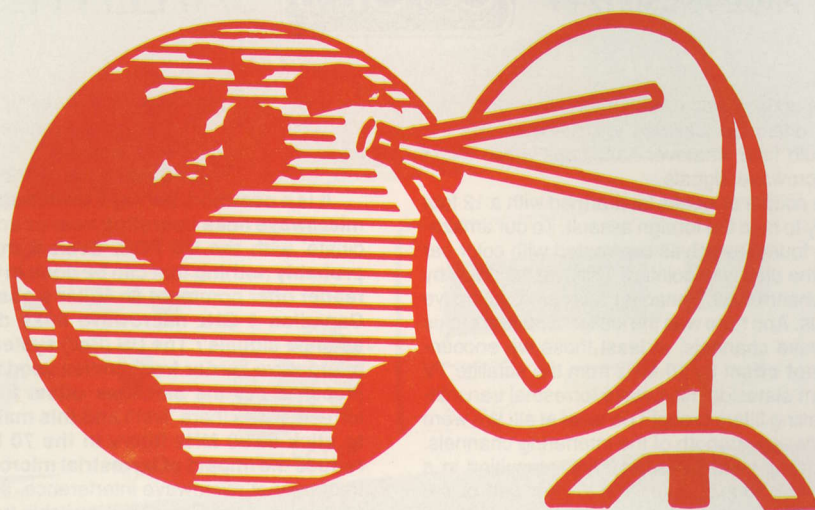
Getting some 'stability' into the Salt Lake City satellite scene will be good for all of us!

THOSE Tricky Canadians

Canada is shipping 'product' through the USA and they are not paying any duty. What product? Commercial microwave beams are smuggled daily across Sugar Island in Michigan's Eastern Upper Peninsula.

We recently tested a potential TVRO site on Sugar Island, near Sault Ste. Marie, for microwave interference. We found the location to be in the center of a (very) intense microwave beam in the 4 GHz band. The beam contained six channels and the off-ending signals were radiating from a tower located near Port Lock, Ontario. They are being beamed across Michigan's Sugar Island toward Sault Ste. Marie, Ontario. The tower's location is approximately 4 miles SE of our test site; RCA F3R is to the southwest.

The test equipment gave only an 'indication' of the origin of the



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signals and their presence; nothing about the content. Our customer, faced with loss of 'some' channels, decided to go ahead with the TVRO installation. He would face whatever handicaps which might arise from the 'enemy' microwave signals.

We arrived at the site a couple of weeks later armed with a 12 foot dish and notch filters, ready to face the foreign assault. To our amazement, and later horror, we found ourselves confronted with color bar patterns no matter where the dish was pointed! This was followed by our discovery of 5 other channels of Canadian television, all active with programming materials. And here was the kicker; it appears to us that the Canadian microwave channels, at least those we encountered at this location, are **not offset** by 10 MHz from the satellite TV channels, as are those from stateside microwave terrestrial transmitters. Needless to say, installing filters brought no relief at all! We were defenseless against the intense strength of the interfering channels. They were so strong that they overlapped channels, resulting in a TVRO installation that only produces satellite TV from half of the available 24 channels rather than the hoped for 75% of the available channels. Half of the customer's viewing space is gone, forfeited to the bombardment of a 'foreign' microwave barrage that is crawling all over our ground and intruding in our airspace.

We are presently considering the ramifications of a 300 foot tall steel fence.



Wayne A. Miller
Gaylord Communications & Electronics
P.O. Box 441
Gaylord, Mi. 49735

It is a common, perhaps even required, practice for Canadian microwave links operating near or across the US border to 'coordinate' with the US FCC. Even if this has been done, there is probably nothing that can be done in this instance. Can any other reader offer comment on Miller's observation that (at least some) Canadian 4 GHz microwave links do NOT offset 10 MHz from satellite signals? The US (Bell) systems do offset from the exact microwave carrier frequencies used for satellite (it would be more proper to say the satellites offset from the terrestrial links since terrestrial was there 'first') and this makes it possible for installers to stick 60/80 MHz filters in the 70 MHz IF systems to at least reduce the impact of terrestrial microwave signals (for a complete treatment of microwave interference, see the ASTI Handbook from Microwave Filter Company, available from CSD). If you are going to build a 300 foot anything, why not make the fence parabolic in shape, pointed back at the source transmitter? We expect that if they 'got back' a few hundred parts of what they sent your way, passively from a giant dish, they'd take steps to correct the problem in a hurry!



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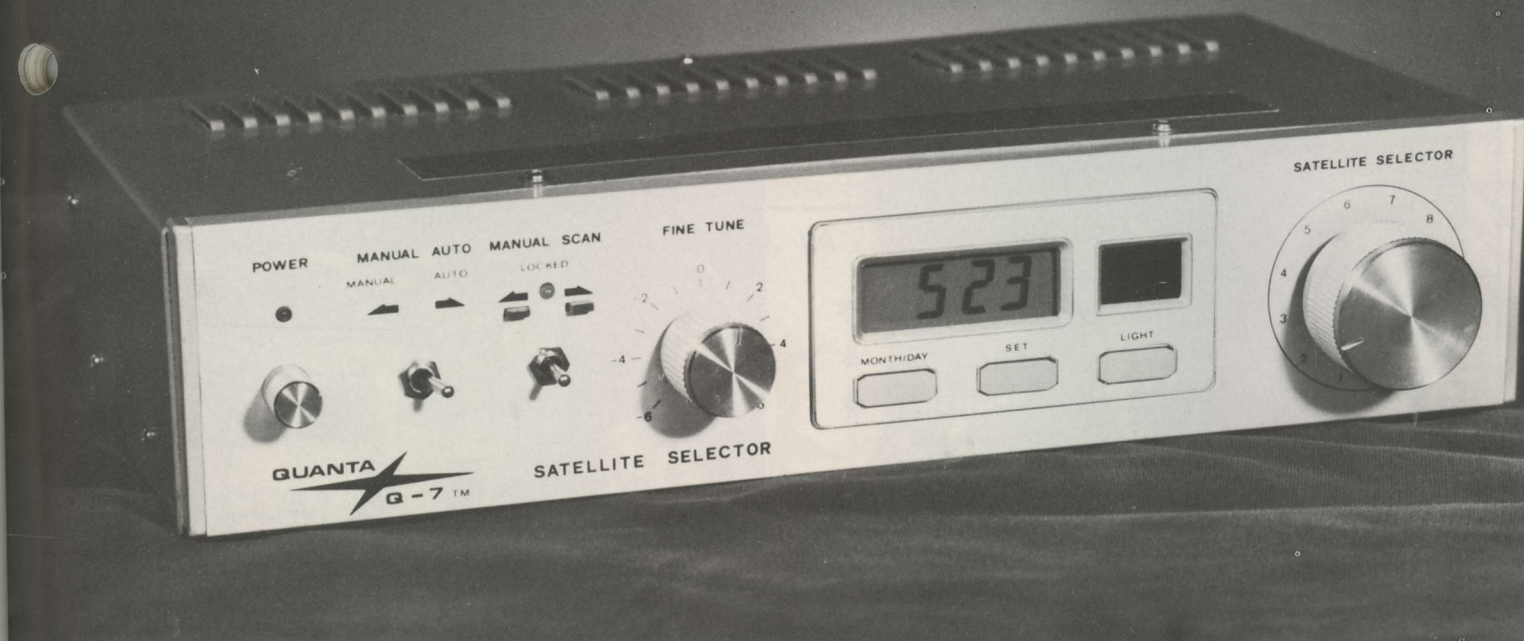
INTELSAT will not give up easily. Faced with strong proposals for a pair of American bred private international satellite systems to serve the 'Atlantic path' between Europe and North America, the international consortium of carriers is battling back at the American FCC and in Congressional hearings.

EXTENSIVE use of COMSTAR D3's TR10 CBS feed transponder during the Grenada crisis. Using Barbados uplink temporarily swung to the D3 position off of its normal Intelsat connection, the first raw, unedited news tape and reports were fed almost continuously from Barbados to the states over a period of several days. Much of the 'best' tape sent back to the states never appeared on US network newscasts, giving satellite viewers a considerable edge on terrestrial

news watchers.

A CHICAGO uplink, apparently intended primarily for non-video applications, would if FCC approved provide direct inter-connection with the Intelsat system in Europe. A new 7.7 meter antenna farm will be built and Mercury Communications in the U.K. would be the European terminus for the system.

NBC and COMSAT General, a part of the Comsat/Intelsat family, have reached an agreement to 'agree.' They plan to use NBC's considerable corporate muscle plus the NBC television affiliates to create a broadly based domestic communications network with individual NBC affiliates providing up and downlink facilities for 12 GHz business networking.



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Alpine, Wyo. 83128



VOA/Voice Of America is trying to figure out how it can become a user of satellites. Presently the VOA uses shortwave frequencies to reach around the world including behind the Iron Curtain. Under study are plans to direct-broadcast radio transmissions to worldwide locations from satellites, and alternate plans to inter-connect the entire network for continued use of terrestrial transmitters fed by satellite linking. The BBC is already using Indian Ocean satellites to carry linking from London to remote transmitters serving the Mediterranean and Asian areas.

FLIGHT F7 of Intelsat V went off aboard Ariane with no major hitches. The bird is now tethered at 60 degrees east and will supply primary service for the Indian Ocean region of the Intelsat network.

HUGHES claims to have broken the 'power barrier' in announcing their new HS 393 'wide body' satellite designs. One version of the newly designed bird will handle up to 16 separate transponders at either C or K(u) bands with **50 watts of power per transponder**. With that type of power fed to half-CONUS transmit antennas, the on-ground signal levels would be in the region of 50 dBw. Translating that to 4 GHz receive antenna size, a 3 foot dish would provide service equivalent to today's present 10 foot systems with room to spare. Variations of the design offer up to 48 transponders at 9 watts each or 6 transponders capable of more than 200 watts each.

ANOTHER new Hughes satellite, the HS 399, is an 'economy' version of some of the early 12 transponder satellites (i.e. Westar's 1, 2 and 3). Offering 5 watts per channel the satellite would build and launch for 1/3rd the cost of a 'standard' 24 transponder bird.

FORD AEROSPACE had a similar announcement recently, offering a 'super bus' family of newly designed satellites with top power capabilities of 230 watts per transponder in Ku band.

DBS applicants hopeful that the FCC might step in and mandate receiver technical parameters will have to settle for an open market. The FCC 'working group' assigned to sort out the various DBS planner interests has decided that no technical operating standards should be



created; and that at most, only common frequency assignments and receiver radiation standards should be addressed by the FCC. Still ahead; an effort to standardize transmission bandwidths and scrambling technologies.

1985 is not that far away and FCC is now planning how the U.S. delegation will handle the international conference scheduled for that



year on re-allocation of geo-stationary (Clarke orbit) resources. One FCC proposal; to limit any new planning and coordination to frequencies **below 15 GHz** since the next band after 12 GHz (20 GHz) is not yet adequately understood. If you think 12 GHz antennas are small for gain earned, wait until you see how small a 50 dB gain 20 GHz 'dish' will be!

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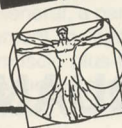


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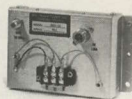
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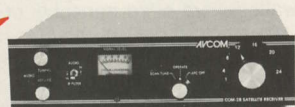


COM-2A

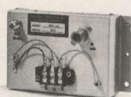


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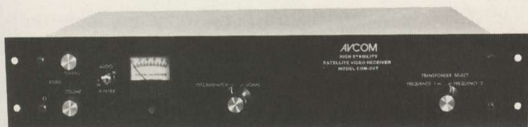
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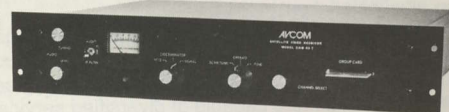
AVCOM's COM-20T High Stability Satellite Video Receiver is the answer to your need for a highly stable and reliable receiver for cable, private cable, radio stations, TV stations, BIZNET, News, Weather & Music Services, and other dedicated applications. The COM-20T can be factory or field adjusted to a particular transponder and will

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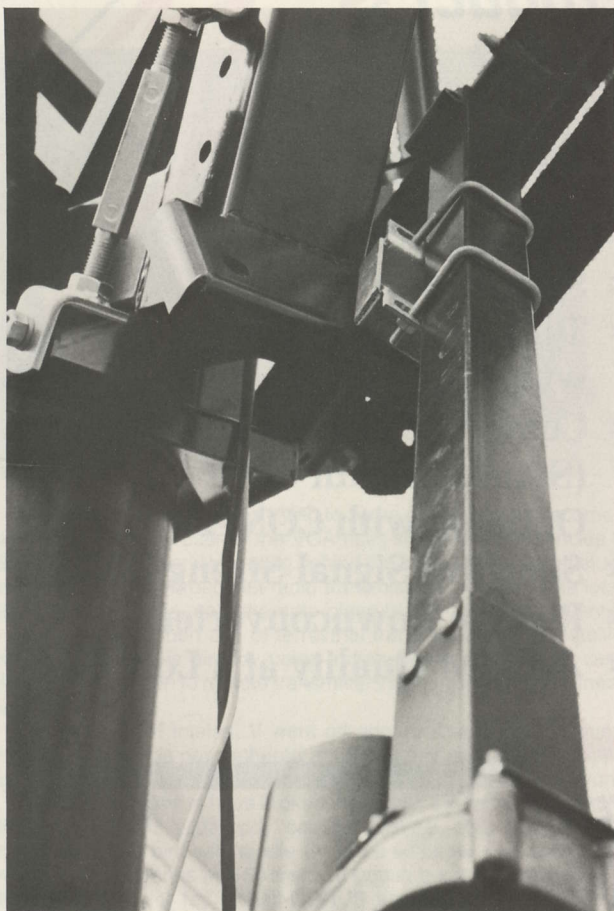
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CANADIAN Satellite Expo, February 3-5 at the Delta River Inn in Vancouver, shaping up to be a major event. Trans-Canadian caravans are planned heading to the show and more than 100 exhibit booths had been sold by the first of November. Information from 604/430-4040.

BBC is bent on providing satellite delivered 'cultural channel' to European cable headends, and if it is successful, eventually to European homes via DBS. BBC was partner-of-sorts with RCA and others in ill-fated F4 service that folded this past spring after losing over \$35M.

GENERAL INSTRUMENT has a contract which buyer Northstar Home Theater places at \$73M to provide Northstar with 12 GHz DBS receiving systems for individual homes in Canada. Northstar is packaging cable-directed ANIK 3 feeds into a package for home use at around \$16.50 per channel per month. The individual terminals, which are to be owned by the subscribers, will sell for around \$1500 Canadian plus installation.

INTELSAT, which has always tried to be all things to all users, may be getting ready to change that approach. Each successive generation of Intelsat birds has always been 'bigger and better'; more complex, costly, and more capable of diversified services. The next generation, the VI series, scheduled for 1987 initial deployment, follows that trend. Now Intelsat is studying whether it should be offering some 'backed-off' versions for specialized applications, such as spot beam video leasing services to national countries in Africa, for example. The net result of this is that Intelsat would like to continue to be the 'satellite carrier' for everyone and if they have to design special birds for that purpose to keep individual customer-nations from launching their own dedicated domsat birds, they will be ready to take that step.

SBS has ordered two additional 12 GHz birds (SBS 5 to be delivered June of 1986; SBS 6 scheduled for replacement service as SBS 1 ages). The newest family will have separate vertical and



horizontal polarization placing narrow band transmissions on horizontal and wideband (video) on vertical. Power levels to 20 watts on 14 transponders and 40 watts to five other transponders are planned. The design life will be 10 years rather than the present 7 years and spot beams to Hawaii and Alaska will be available (present birds have no spot beams).

TO GET more interest going in using Galaxy I services, Hughes has worked out an agreement to finance additional (Cable TV) terminals to receive the G1 programming. Several would-be program suppliers plan to begin regular use of G1 transponders within the first 180 days of 1984, including Group W, WTBS, Viacom and C-SPAN.

UPCOMING LAUNCHES from Cape include Westar 6 and latest Indonesian Palapa birds. Both will be carried on shuttle trips in early 1984.

RKO GENERAL's digital radio network now operating on F1R, TR19. A total of six channels, each 15 kHz wide, are in use supplying audio network programming to more than 125 radio markets.

RCA's SATCOM 2R bird (72 west) is now operational, but of some worry to RCA operators. The bird is showing uneven heating problems indicating there may be a problem with the insulation system on board.

RECOVERY at Scientific Atlanta continues with four consecutive quarters of improved earnings. The company experienced a down turn in 1982 following problems with cable TV converter products.

GROUP W, owner of the Satellite News Channel transponder space on W5 has no plans for the half dozen or so transponders that were in use for the regional and national feeds of SNC. Payments to Western Union, however, go on and the dormant status is not expected to remain that way very long.

GRENADA excursion by US and Caribbean area forces will have at least one direct side effect on the satellite world. Just prior to the invasion, Moscow announced an agreement to equip the island nation with a Gorizont up and downlink terminal to give it direct interconnection to both Moscow and Cuba/Nicaragua. Not now.



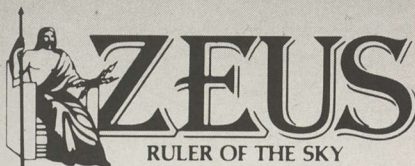


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ANOTHER island that will get satellite link is Falklands group in South Atlantic. A new \$3M terminal is now under construction and will provide first direct link out of islands to U.K. and balance of the world.

NEXT time you are in Paris, book your stay at the Hotel Meridien. This is the **first** French location to have permanent satellite TV service via the London based ST/Plc service. A three meter dish plus electronics makes it all possible to the 1,050 rooms.

*—We are grateful for the excellent photography from the Orlando show appearing in this issue to Tim Harrington of Dallas, Texas. In addition to being the very talented son of Tom Harrington, Tim is an accomplished photographer who instinctively knows where to point the camera and when to pull the trigger!

COOP/ Continued from page 5

outrageous. He could be a stand up comic in any nightclub in America and be a smash hit. His humor was always topical, perhaps a bit on the 'inside' for those who don't have the background of the cable and broadcasting industries. You could tell who did; they laughed at virtually everything he said as almost everything he said was a pointed barb at some segment of the industry he seemingly loves and hates at the same time. Those who were listening carefully 'thought' that just maybe they detected some unhappiness with the cable industry as a group as he spoke. If it was there, it was probably on purpose in recognition that he was standing before a crowd that doesn't always see eye to eye with the cable industry.

At the proper and appointed time Turner reached down on the podium and picked up his watch. He always finds out from his host how long they want him 'up front,' and then he removes his watch as he opens up and lays it down on the podium. Stealing a glance every now and then he gets himself off precisely on time with a wave of the hand and an exit back to his seat. Shortly thereafter the man from Atlanta, 'Outrageous Ted' as he is sometimes known, helped wife



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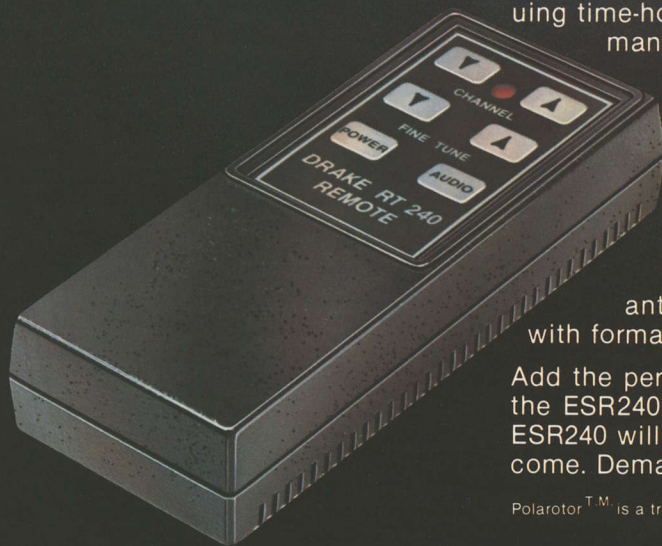
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ANTENNAS as far as the eye could see. Not the most ever at one spot, but a definite move towards more mesh designs and fewer solid metal designs.

Jane to her feet and they quietly slipped off into the night and a waiting chartered plane.

The arrival of Goldwater was 'on time' but later than hoped. The Senator was greeted as he entered the banquet hall by a full **U.S. Navy band**. As he strode to the podium, with some difficulty because of the crowd and the long day he had already put in at the Senate, the crowd roared their approval and stood to welcome the distinguished guest. **SPACE** was ready for Goldwater. In spades.

Getting Goldwater to accept the invitation to appear took no small amount of political maneuvering. For those who don't know, Senator Barry Goldwater is the most distinguished member of the U.S. Senate or U.S. House with an electronics background. He is the only licensed



THE EVER busy aisleways of the Orlando show; filled right to the end.

'Ham' (amateur) radio operator in the U.S. Senate. In some introductory remarks, someone noted that riding in Goldwater's car was like riding in a 'mobile earth station.'

In deep appreciation that the Senator would agree to come out of a hectic schedule in the Senate onto a waiting airplane and fly the two hours to Orlando to address a crowd of TVRO enthusiasts, **SPACE** had arranged for a series of videotaped 'testimonials' for the man. A wide range of U.S. Senators, **Vice President George Bush** and others had taken time out of their respective busy schedules to go before Senate closed circuit TV cameras to record on videotape brief remarks of thanks and commendation for the leadership Goldwater has shown in the Senate on matters relating to communications. **SPACE** VP Brown provided the tapes to this writer and the afternoon

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The Satellite Man

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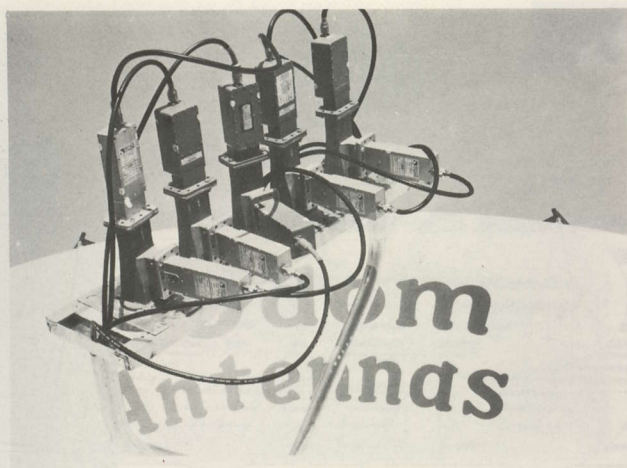
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ONE WAY to 'inventory' LNAs. Odom antennas had this five feed system operational with ten LNAs in place; one vertical and one horizontal on each bird.

prior to the banquet we reviewed the dozen tapes and selected segments in each for the 'testimonial' portion of the dinner.

With a Nova 'super screen' set up in the banquet hall, Goldwater welcomed and on stage, Brown began the introduction. As Brown wound through the introduction he would pause after an appropriate sub-introduction of the testimonial speaker and we rolled the videotape through the NOVA projector. One after the other the distinguished people appeared on the screen, mentioned how much they respected Barry Goldwater and made some reference to SPACE, the industry we all are a part of, and how happy they were to be 'on hand with us' at the banquet. **Missouri's Senator Danforth** 'wrapped' the videotaped testimonials by reminding Goldwater that this past sum-

mer when he sought Goldwater's advice on a matter relating to the home TVRO industry, he found himself on the front cover of SPACE's magazine **SATVISION** the following month.

"I hesitate to think what might have happened to me if I had opposed Goldwater on this issue," he quipped. The hall rang with laughter.

Goldwater, conversant on what we are and what we do, and the promise we hold for rural and suburban America, worked from memory. He knew just which subjects to address; and which to avoid. He made sure everyone knew that **his** interest in electronics has spanned nearly 60 years, and that he had in fact begun building a home TVRO several years ago. In fact, we began supplying him with **CSD** back in 1980 and saw to it during the Washington industry trade show in the spring of 1981 that his office had a complete collection of all of the industry manuals issued to that time. For the crowd, he espoused what he labeled as a personal conviction that "**Anything in the airwaves that happens to come onto my property is mine to use as I see fit.**" This is, of course, a long held tenet of the Ham radio operator and it has been that conviction and open approach to new technology which has driven amateur radio enthusiasts for decades.

There was absolutely no way anyone attending the banquet could help but feel 'good' about the industry we are all a part of, following the appearance of Turner and Goldwater. Turner made all of those on hand recognize that while we may still be a relatively small force in the national and international communications structure, we were at least now visible and deserving of official **business** recognition. Turner doesn't hop aboard a plane with his wife for a quick two hour trip just to get a free banquet meal. The man has eaten more banquet meals than he can count, or cares to remember. Having him at SPACE was good for the industry, and more important, it shows there is an awakening recognition that our industry is rapidly maturing into a potent force.

Goldwater's appearance was extra-special. The senior member of the Senate on matters relating to communications does not speak at but a fraction of those occasions where he is invited. He is no longer a young man and a trip such as this is a considerable effort after a full day in Washington. He didn't **have** to do it; **but he did**, willingly

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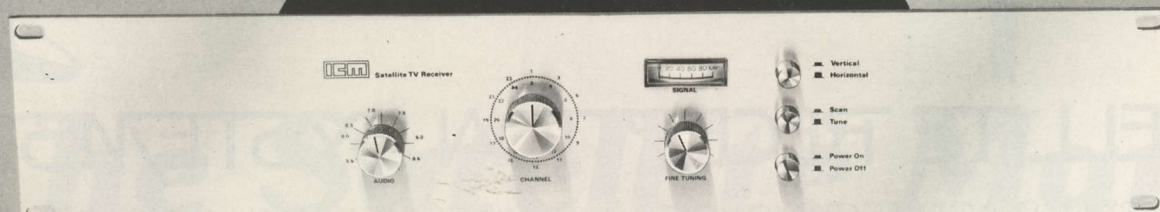
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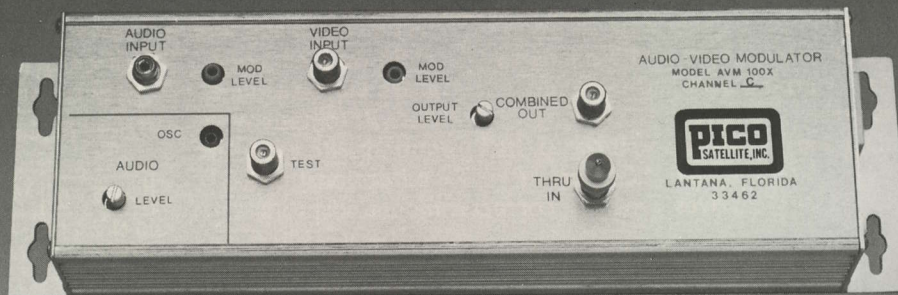
ASTRONAUT Gene Cernan, Senator Barry Goldwater and Australian/Aussat's Olga Sawtell discussing birds in orbit.

and with considerable enthusiasm. In the brief interlude between the official SPACE business and the appearance of Goldwater, Astronaut Gene Cernan 'filled' while Goldwater was on his way from the airport. Cernan is now a part of the 'Intersat Team' and as the last man to walk on the surface of the moon in the Apollo program, he had a special affinity with those attending. Further recognition that the TVRO industry and SPACE have arrived; sitting with Gene and the others at the banquet table was **Olga Sawtell**, the Marketing Manager for the Australian (AUSSAT) satellite program. Clearly, the industry is moving in higher and higher circles all of the time.

As our cover this month conveys, there was a short period after the Goldwater appearance during which the Senator had the opportunity to briefly tour a segment of the exhibit hall. With a considerable

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entourage in front of him, beside him and behind him. Goldwater moved to the exhibit hall to sample the wonders of the TVRO industry. He paused in front of the Intersat booth long enough for David McClaskey to begin showing the Senator the wonders of the IQ-160 intelligent terminal system. With Cernan helping, Goldwater saw how a modern home TVRO terminal gives the user full operational control for more than 100 satellite service channels. Goldwater, no stranger to electronic gadgets, was genuinely impressed with what he saw.



INTERNATIONAL Furor

One of the least-well-attended sessions at the recent SPACE Orlando show was held on Saturday morning, as the show was in its closing hours. The purpose of the session was to consider the various threats now facing those who **ship** TVRO hardware outside of the USA and Canada, those who **install** TVRO equipment outside of the USA and Canada, and those who **use** TVRO equipment outside of the

USA and Canada. The threats vary with locales of the world but they are substantial whether taken individually or as a whole.

The session was not well attended (averaging 50 participants over the two hour period) largely because only a small fraction of those attending the show were, indeed, from off-shore regions in the world. The largest contingent on hand came from Latin America and many of the faces in the crowd were familiar; having come to numerous prior industry shows over the past four years. At least a couple of those attending had started with us at the first trade show in Oklahoma back in the summer of 1979.

By a show of hands and a registration process, we quickly discovered we had representatives in the group from 16 countries spanning Europe, North and South America, Oceania and Asia. Only Africa, as a continental area, was not in attendance. The session started off with **Fernando Batlle** of the **Dominican Republic** presenting a position paper; sort of a mini-white-paper reporting on the unique problem facing those who live and work in the Caribbean and Latin America. The issue here was something now abbreviated **CBI** or the **Caribbean Basin Initiative**. We have written about the CBI process in many past issues of **CSD**, pointing out that the present administration in Washington is attempting to turn the Caribbean and Latin America into a western hemisphere version of 'Taiwan.' The concept is that if certain trade barriers are dropped, to allow goods manufactured in the Caribbean and Latin America to have easier access to the US market, that manufacturing plants will be created in the region. This in turn will raise the economic levels of the areas involved, shifting the economic emphasis away from total dependence on either agricultural pursuits or tourism or a combination of the two. Decades ago the economic problems facing Puerto Rico, in the Caribbean, benefitted from a similar plan (Operation Bootstrap) and today Puerto Rico enjoys the highest per-capita income level of all of the heavily populated regions in the Caribbean and Latin America.

As commendable as this exercise is, there are certain 'strings' which the US government has attached to a country participating in the plan. To be accorded '**CBI Beneficiary Status**' by Uncle Sam, the nations so involved must declare their willingness to **protect US**

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It has four corrected video and four audio outputs, copy-guard stabilizer function, RF output with optional RF modulator and optional rack-mount adaptors.

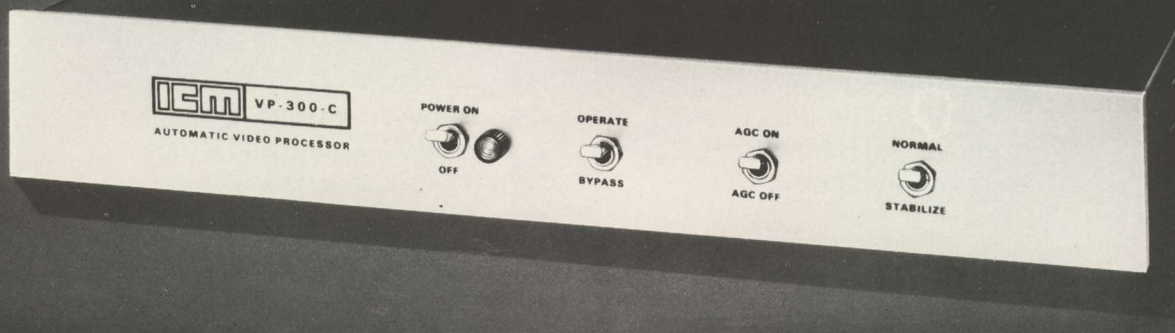
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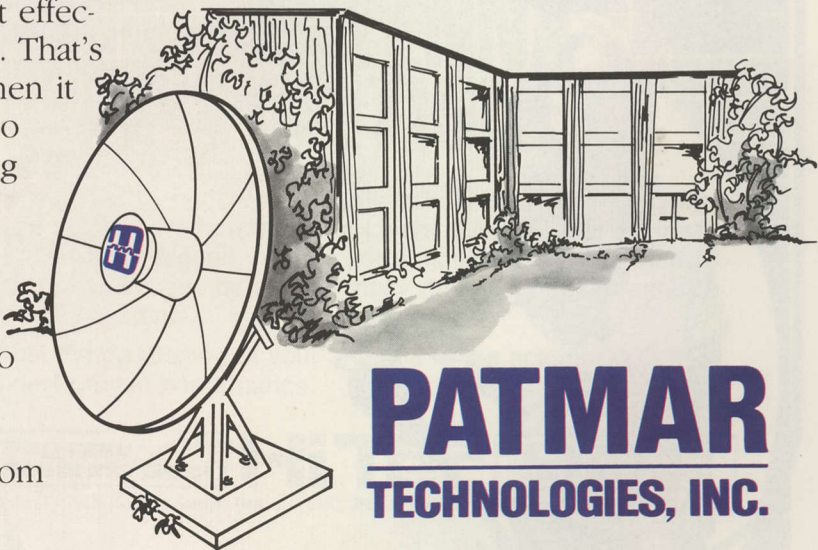
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citizens residing and working in their countries, agree that certain enforcement agencies from the US (such as the Treasury Department) can have relatively **free access** to banking and court records within the impacted countries, and further agree that US **'property'** will be protected. It is one of the small print sections of the later requirement that is causing all of the problems with CBI for many of the designated countries.

In the small print, the CBI act states that US 'copyrights' must be protected. That means that if there is a company located, in say Haiti, which specializes in bringing copies of US created and produced best selling books to Haiti where the books are reproduced for worldwide distribution **without benefit of payment** to the US copyright owners, the Haitian government must agree to crack down and stop such activities if Haiti is to be a CBI beneficiary country. That seems fair enough.

At the same time, the 'protection of US copyrights' also extends to other forms of mass distribution of information and entertainment. Television, in particular, is our subject here. Under the terms of CBI, if a country allows the use of US television or movie products, within the country, without the consent and agreement of the US copyright owner, the country can and in fact will be declared ineligible for CBI benefits. The pushers and movers behind this one is the all powerful MPAA or **Motion Picture Association (of) America**. The exact language of the CBI Act states that CBI eligibility will depend upon **"The extent to which (the beneficiary country) provides under its (own) laws adequate and effective means for foreign nations to secure, exercise, and enforce exclusive rights of intellectual properties, including patent, trademark and copyright rights."**

That means that if Haiti does not create laws to prohibit its own citizens from buying a copy of **War and Peace** in Miami and taking that copy to Haiti to mass-reproduce, Haiti cannot be a part of the 'Taiwanization' of the Caribbean.

The CBI Act also states that eligibility will depend upon **"The extent to which (the beneficiary country) prohibits its nationals from engaging in the broadcast of copyrighted material, including films and television materials belonging to U.S. Copyright**

owners, without their expressed consent."

That means that if Jamaica allows any of its own citizens (nationals) to receive and (re)broadcast on its television systems programs owned by U.S. copyright owners when permission for such use has not been contracted for, the country will not be eligible for CBI benefits.

Battle did an excellent job of summarizing just where this matter stands today, and pointed out that there are today two separate teams of 'CBI Negotiators' making the rounds of thirty plus affected countries meeting with the government officials in each country. In his situation in the Dominican Republic, he was allowed to talk directly with the CBI teams and he quickly came to a number of reasoned conclusions we will share with you. He was also the subject of an equipment confiscation exercise where DR officials, acting under internal laws, came to his place of business and hauled off a wide assortment of equipment relating to satellite reception. Battle manufactures TVRO antennas (big ones, to 7.5 meters in size) in the DR as well as holding one of two 'exclusive permits' granted by the national government to engage in the 'broadcast,' using secure frequencies, of US satellite signals to subscribers. The latter operation was just getting underway when the CBI teams hit the DR.

At the present time there are dozens of users of satellite services from the U.S. in the Caribbean and Latin America. **Dozens of 'commercial' users.** They run the gamut from cable systems serving upwards of 25,000 homes to small terrestrial re-broadcast transmitters reaching a dozen homes or less per site. They all share one thing in common; they do not have official permission from U.S. program rights owners to be using the signals on a 'commercial' basis.

"Broadcasting" or 'rebroadcasting'; what does it mean in the CBI Act?

It turns out that it really means 'any commercial, shared use' of US satellite signals. It does **NOT** mean by narrow definition the re-transmission, **through the air**, of U.S. satellite signals. A cable system, by interpretation, means 'broadcasting' in this context. That means that if a country wishes to be a part of the CBI Act and its benefits, it cannot allow any of its citizens to engage in the retransmission by **any technical means** of U.S. satellite signals to others in the

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FERNANDO BATLLE (left) and Bob Behar at the formation of the International Chapter of SPACE in Orlando.

country. It also means that if a country does not create laws to restrict the 'illegal use' of U.S. satellite signals, **perhaps even** on a personal home basis, and then enforce those laws, that country cannot be a part of the act.

Enter the real world.

Some nations have already taken positive steps to stop the growth of TVRO systems in their area. **Venezuela**, for example, has outright **banned** the importation of **any** TVRO equipment. They have also banned the installation (even if the product is locally produced) of parabolic antennas 'capable of reception' from U.S. domsats. El Salvador, closely tied to the U.S. at the moment because of military activities in the region, has adopted a law requiring that TVRO sys-

tems be **licensed** by the Federal government prior to importation, or, installation. Not bad? Not quite. They will not **grant** such a license. They have not **outlawed** TVRO systems, as Venezuela has done; they have simply placed a bureaucratic stumbling block in the way.

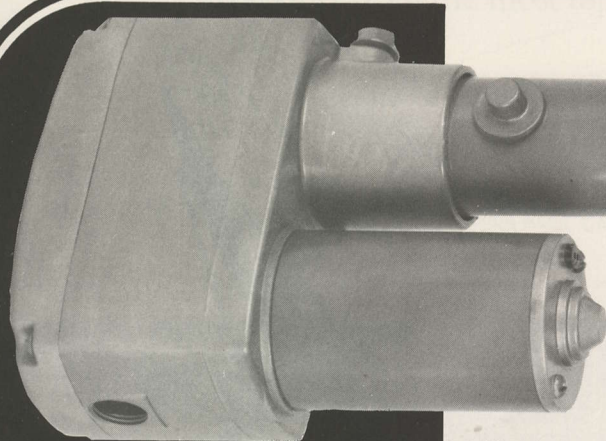
As Fernando told the group . . .

"At the root of this problem, there is a vicious circle among the cable operators, the program suppliers, and the movie producers. This circle must be broken to resolve this problem. The cable operators request the service from the program suppliers. The program suppliers in turn DENY the service on the grounds that they do not own the rights for foreign distribution and the movie producers will not do anything to resolve this impasse. The refusal to deal and the denial of access is the major cause of the problem at hand. It is a result of this situation that the piracy takes place."

It is the MPAA that is behind the push (through the U.S. government) to insist that this fine-print requirement be adhered to by the participating countries. Even the President of the United States, under the provisions of the CBI act, may not exempt a country from full compliance with this provision. The law states that failure to comply is **automatic grounds** for non participation.

Many cable firms have placed into escrow substantial sums of money to pay for program use rights. That money is available to HBO et al merely for the asking; all that HBO has to do to collect what must by now amount to millions of dollars is to sign a contract authorizing the various cable (et al) systems to utilize the programming. Fernando believes, after extensive traveling throughout the area, that virtually all of the systems now operating would willingly pay for the service if they were accorded that opportunity.

HBO cannot, they say, get contractual rights from the motion picture producers and distributors for 'foreign distribution.' This decision, **arbitrarily arrived at by the motion picture folks**, is enforced by their trade association representative MPAA. There is, to re-coin a popular US phrase, a complete **'refusal to deal'** on the part of the MPAA and that extends through HBO et al who are licensees for their



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product(s).

According to those in attendance at the Orlando session, many of the nations that have been visited by the CBI 'teams' to date have shown a reluctance to agree to these provisions. Some of the nations feel that **if they agree to enforce US laws**, they are giving up some of their **own** national autonomy. Some feel that to allow IRS and other agents access to their banking and corporate records is an invasion of their national sovereignty. Others feel that **the U.S. has created this situation** by allowing its U.S. domsat operators to 'spill signals' into the Caribbean and Latin America and this problem would not exist if the U.S. policed its own private and corporate citizens 'at home.' At least a handful of the nations argue that **they** are being asked to **bear the cost** of administering protection for U.S. property when the U.S. owners are not taking any special care to protect their property.

There is, therefore, something less than unanimous approval for the CBI program and the 'strings attached' thereto. A strong effort to get at least **some** initial group of Caribbean and Latin American nations 'CBI Certified' **by the 1st of December** is underway.

Battle and others attending meetings with the CBI 'teams' said they found out that the CBI people had no understanding of the real issues here; none of the CBI folks even knew, prior to the meetings, that all efforts to date to get legal, contractual rights to the various motion picture and other services, through HBO/MPAA/Hollywood had failed **because** the U.S. owners **refused to deal** or talk about it. That set the CBI team ears buzzing although as 'administrators' rather than policy makers they were powerless to intervene nor to change their mandate to get Caribbean and Latin American nation participation in the plan.

If the CBI problem generated lots of talk and several sound suggestions, the next problem on the agenda had a wider reach. The problem next discussed was 'Section 1520/A' of the **Export Control Act**. That's the requirement that prior to the shipment of any satellite television hardware to any foreign destination other than Canada, that the U.S. Department of State, Commerce Department, CIA and so on have the opportunity to inspect the shipper and shippee to determine

whether any 'sensitive, high technology goods' are being sent out of the USA into an area of the world where such technology might be a hindrance to US security. In other words, satellite TVRO systems are on a 'banned export list' except when such exports have been approved with the U.S. government **in advance** of shipment.

Representatives from all over the world, in attendance, addressed this issue. SPACE reported that there have been ongoing talks with the U.S. Department of Commerce and that while it may take as much as 9 additional months to resolve, there **has been** some progress. **Bob Behar** of Hero Communications outlined a system of establishing distributors in various parts of the world, and certifying those distributors in advance on a one-time basis for shipments to be made over an annualized period of 12 months. In this way **individual shipments** could go out of the country to an in-advance certified distributor without having to prepare long, complicated and time consuming individual shipment applications for **each** shipment.

The most likely 'early relief' will be in the area of parabolic antenna surfaces. The law specifies that any equipment designed to function above a frequency of 960 MHz must be individually approved prior to export. A dish antenna, less the feed, has no particular frequency of operation; it can be used at virtually any frequency in the VHF/UHF spectrum as well as in the SHF/microwave spectrum. It is **only after** the feed is attached that the frequency of operation is pinned down and selected. Feeds, LNAs and receivers, on the other hand, clearly function above 960 MHz and that is a cut off for export approval.

One of the side effects of the crack down on the export of TVRO hardware from the USA is that Canadian TVRO suppliers have moved aggressively to serve the Caribbean and Latin American market. Many of the off-shore buyers now purchase their goods in Canada, where no export controls exist. A number of suppliers in the USA have lamented that valuable export dollars, in international trade, have been lost to the USA by this action although the hardware, usually available jointly in the US and Canada, is not being denied to the off-shore users. In effect, the hardware continues to move although the source for it has changed.

Others argue that the broad interpretation of 1520/A really should

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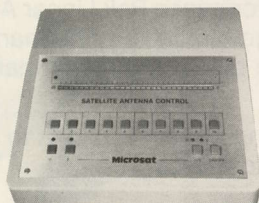
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not be dealing with satellite television systems in the first place; that the purpose of the regulation was to stop the flow of sensitive commodities of a high-tech nature to ultimate destinations such as Cuba, and other Communist Block nations. The point is that 4 GHz TVRO systems are hardly 'high-tech' any more and that to stop their exportation does nothing but hinder the US suppliers.

Less explosive discussions were held on the general subject of **Intelsat** reception techniques and there was a technical survey of the antenna types and sizes required, and the special receivers usually required to receive Intelsat transmissions. Fernando Batlle again made the point that all of the furor in the Caribbean and Latin America concerning reception of 'foreign' TV signals involves just the **US domsat signal sources** and he is puzzled why there has not been more attention paid to the Intelsat reception aspect of the problem as well. With a 12 to 20 foot dish anywhere in the Caribbean and most of Latin America, there are as many as four Mexico City TV channels, a pair of channels from Brazil, a channel from Venezuela and a channel from Argentina now available. In some areas additional service channels from Colombia and Peru are also available with more coming on line in 1984. **Steve Birkill** from England addressed the various Intelsat full and half transponder transmission formats and spelled out the receiver modifications required to provide high quality reception from each.

In the end, it was evident to all attending that **'together there was strength'** while **'divided there was only weakness.'** Accordingly, the group voted to form an **'International Chapter of SPACE'** and with some encouragement from representatives of SPACE established a goal of creating a stand-alone International Organization which will be self-governing with an initial Board of Management of five members. Between the Orlando SPACE show and the next (March) show in Las Vegas, the group will become a legal entity, elect its own officers and prepare a formal submission to SPACE requesting that they be recognized as an affiliated organization. The plan is to create and maintain **their own dues structure and budget**, but to work as closely with SPACE as possible on those issues where there can be a joint effort. A request to allow a representative from the International Chapter of SPACE to sit formally with full voting rights on the SPACE Board of Directors will be offered to the SPACE Board in March.

COLOMBIA'S YEPES (left), **DR's Batlle** and **El Salvador's Bojorquez** (right) in Orlando; first team from Latin America representing the new International arm of SPACE.



The five man interim board selected is as follows:

- 1) President and member of the board; **Fernando Batlle**, Angel Severo Cabral #49, Urb. Fernandez, Santo Domingo, **Dominican Republic**.
- 2) Board member for the Caribbean and Latin America; **Mario Yepes**, P.O. Box 5205, Medellin, **Colombia**, South America.
- 3) Board member for the Caribbean and Latin America; **Morgan Bojorquez**, San Salvador, **El Salvador** (U.S. mail address of

Suite 501, 100 N.W. 37th Av., Miami, Fl. 33125; 305/541-4433.)

- 4) Board member for Europe and the Middle East; **Michael Romano**, 119 Rue des Chenes, 92 Suresnes, **France** (telephone 747-53-00, extension 2754).
- 5) Board member for Oceania; **John Morgan**, P.O. Box 411, Madang, **Papua, New Guinea**.

Those involved in the TVRO industry worldwide are urged to contact the board member closest to them to register yourself as being involved in the industry, and, to send a letter to Fernando Batlle to place your name on the international mailing list for a newsletter which will keep you advised of activities of the group.

AFTERmath To SFPC At Orlando

In one of the sessions held in Orlando, there was a call for a showing of hands from those in the audience. Perhaps 700 were sitting in the convention hall at the time. And depending upon who you asked to do the counting, someplace between 75 and 90% of those there at the time indicated they had never attended an industry trade show previously. It is possible they misunderstood the question and thought it related to a previous 'SPACE' industry trade show (there had only been one previously; that in Omaha in the summer of 1982). Later on, in another survey, between 35 and 40% indicated they came to Orlando **primarily** to learn about the SFPC \$750,000,000 funding program.

The Satellite Financial Planning Corporation presentation was all inclusive. It began with a pair of private seminars for dealers of Paradigm (Paraclipse) and Intersat on Wednesday the 2nd. This was followed on the evening of the 2nd with an appearance before the SPACE Board of Directors, and then an invite-only reception where those attending were given the opportunity to 'preview' the program before the general session that followed Thursday afternoon.

There was, at the last minute, a sudden recognition by some members of the SPACE board that perhaps the appearance of the SFPC presentation at the SPACE show **might appear** to some to be an **endorsement** of the SFPC program. This was unfortunate, of

course, and since the issue was raised late (barely hours before the show) there was a concern how to handle this potential problem. It was finally determined that a 'disclaimer' should be read in front of **ALL** sessions at the seminar stating that such appearances did not constitute an endorsement by SPACE of the products or services discussed, and that lacking a detailed study of such products or services, no such endorsement could be given. This knife cut across all of the subjects discussed at the seminar level during the show and it was the general feeling that this particular issue will receive far more advanced study at future (SPACE affiliated) trade shows.

Between 1100 and 1200 people representing themselves as dealers took home SFPC literature after attending the various SFPC seminars. We checked with SFPC towards the middle of November to learn how the program was going. Other than the glib "the telephones are in a melt down state," indicating the onrush of dealer calls into the program, here is where we feel the program was just after a week or so of activity (it officially began on November 8th).

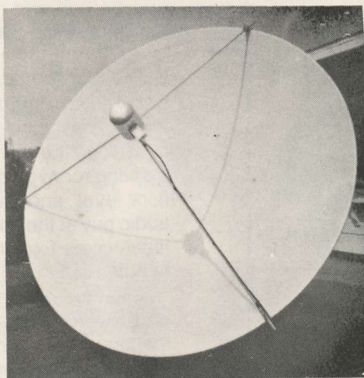
With four separate 800 number operators on duty, the phones were clocked at 'in use' an average of nearly nine hours per day (each). With the offices opening based upon east coast time and closing based upon west coast time, it was turning into a long day for SFPC. There was a shortage of paperwork for the dealers at the show, primarily because SFPC wanted to **mail** the full and detailed packets and multiple dealer work and application forms out to the dealers using the service. This didn't sit well with some dealers who wanted to head home with hundreds of work and application form sheets to flood their respective customers with the opportunity to buy a TVRO 'on credit.'

Of the first 50 applications in the door, precisely half or 25 were approved. That was a tad disappointing to SFPC since they had hoped the applications versus approval ratios would be closer to 75%. However, SFPC's Bill Young felt that many of the dealers submitting applications on the first day may have been trying to push through customers they already had on line, but whom they could not complete a sale for because the customers did not have an appropriate credit standing.

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'We found out that we were getting applications from people who, while they may be home owners (i.e. buying a home), are not credit worthy.' We wondered what the phrase meant.

"If the head of a family is not earning (taking home) a minimum of \$15,000 per year, there is no point in submitting a credit application," Young noted. "That is simply a cut-off for the bank and while they might consider an application where both the husband and wife work, totaling over \$15,000 take home per year, they won't accept an application that comes under that; whether one or both work."

There are other caveats for the dealers.

"When a home owner has a bad credit record, where a head of house has been sued or chased for failing to live up to his credit obligations, the bank won't approve the application. The dealer needs to spend some time determining that his customers have no 'black marks' on their credit. Sending in somebody who has had problems getting credit won't do anything but clog up the machinery."

Young went from the Orlando show triumph to the Great Lakes/Ohio Valley show in Columbus over the weekend of November 19th while other staff members such as Larry James headed into a tour circuit covering states such as Texas.

Young again. "I feel it may well be late December before everyone is seated in and using the SFPC loan program on a routine basis. We have a period here where all of the participants need the opportunity to become familiar with the process and how it works." We'll re-visit it as that progress happens.

ENGINEERS Do Their Thing

One of the sessions we did in Orlando had a group of engineers (four to be exact) sitting in a relaxed, round table kind of atmosphere discussion of down converters. Joining me was Steve Koogler of R.L. Drake, Bob McCollum of Microwave Systems Engineering, Steve Birkill of England's SATVRN and Jim Halley of Intersat. Koogler took the position that if a down converter managed to get 15 dB of unwanted image rejection, there was little more to be gained by designing into the system additional image rejection. McCollum took the position that you can gain as much as 10 to 15 noise temperature degrees of system sensitivity if you get your image rejection beyond 20 dB. Koogler wanted to know what the (dollar) price might be for improved performance, and whether you were really getting your money's worth. We didn't resolve the issue but at least we got the dialogue moving. I think there will be more attention to down converter design in the next generation of receivers we see.

Getting top flight, talented engineers to sit down and discuss (and even argue) about design approaches is difficult. Most of the talented engineering in our industry comes from people who are basically young (as microwave engineers go), and who operate in a 'shop' where there is not much engineering formality. Because of the roots of our industry, because we evolved on our own and not out of aerospace or NASA, the guys who create circuits in the TVRO field are usually their own men with something less than universal respect for big corporation microwave design engineers. Getting people like this to 'talk,' out in the open, in a forum, is difficult. I had promised Jim Halley and Bob McCollum that I would not sit them down behind a table, on an elevated platform, facing into an audience sitting below them. That intimidates the audience and it makes the engineers conscious that they are on display. So we hurriedly re-arranged the meeting room by bringing some chairs down from the platform to the floor level, and placed them into a semi-circle. Then, because the audio guy at the convention had disappeared and could not get us the lapel mikes I wanted, we took the stand mikes apart and everyone handled their own microphone.

Now we were at the same physical level as the audience and the front row was flush with the semi-circle. It worked, and I couldn't detect that any of the four felt uncomfortable with being before an audience. The topic matter may have gotten a little stiff for one or two as we moved along, but at least the atmosphere of the 'staging' was relaxed.

I hope that at future shows the engineers who create our products have an opportunity to do this sort of thing on a larger scale. A deep discussion of down converter strip line layout techniques is not for everyone attending. But for those who depend upon our engineering creators to keep us fed with top notch, innovative, products, it is an eye opener to see the engineers freely talking about such things. Let's do it again.

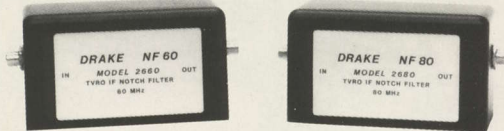
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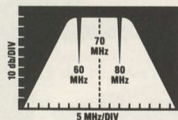
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SPECIFICATIONS

Model Number	Model	Description
2660	NF60	60 MHz notch filter/70 MHz IF
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3 db bandwidth: ± 1.5 MHz of center frequency.
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RE-BROADCASTING Satellite Signals

It was the November 1982 issue of *CSD* where I spent a substantial portion of the issue describing in some detail our multiple channel TV re-broadcasting system here in the Turks and Caicos Islands; how the people reacted to their first television, what type of television was most popular, and how we handled 'piracy.' In the interim year I have heard from dozens, maybe 100 or more, different groups spread throughout the Caribbean, Central and South America, even the Pacific who have emulated our efforts. That makes me feel good, to think something we did here has been instructive to others around the world.

Still, I have not been satisfied we are doing it 'right' here on Provo and I have tried to keep an open mind about the best way to re-distribute low power TV signals in a low-cost way to as many people as possible. This month we look at some recent experiments we began back in September using a novel, relatively new, type of technology. We have worked out a way, with the help of many others, to transmit 12 or even 24 channels of direct-off-satellite TV to the surrounding countryside for what I consider quite low cost; under \$500 per family for 24 channels of reception. Naturally I'd like to do this for say \$100 a family, and ultimately I think it is possible.

What I can 'get away with' down here in the islands, by way of using and re-using the local VHF and UHF spectrum, might not fly within the United States. There is a strange set of circumstances at play within the USA which does not encourage experimentation with new technology. The FCC, it seems, will not license you to 'broadcast' TV (or radio) signals unless you use **existing** technology which they have already allowed for in their rule books. The system we are using here, and which I suspect many others will be using a year from now, cannot be used **legally** within the USA.

The frame work for getting it legal is burdensome and complex. First you must request of the FCC permission to 'experiment.' They will want to know **what** you are going to do, **how** you are going to do it, and **where** you are going to do it. You must assure the FCC that in your experiments you will not be creating any interference to any existing, licensed, 'broadcast' services. If they approve your request for an experimental license, they will tell you that the license is good for a short period of time (not more than a year, typically), that you cannot make any commercial use of the experimental license, and that after the testing you must report to them your results.

Assuming you do this, you will then have to follow this up with a formal request that they create new rules which allows standard licensing of your new broadcasting service. That will entail a long round of FCC notices, comments, shouting and yelling from all of the existing broadcast licensees and perhaps a 10% chance that you will get approval to do legally what I am already doing here in the islands.

The pity of all of this is that it may take two or three years to get such a sequence of events through the FCC. That will be two or three more years where people who could, **today**, have 12 or 24 channels of direct satellite TV, will have to go 'without.' Not everyone has always played the game by the FCC rules. Years ago when the first TV 'translator' stations were built, there was no FCC rule that allowed such a broadcasting station to operate. The people who first built translators, or boosters as they were then called, didn't worry about FCC rules; they lived in Stony Creek, Colorado or Big Shoe, Wyoming and to them a 'booster' was their connection to TV and the outside world. They cared little that such a gadget was not FCC licenseable and less that there were rules against what they were doing. They simply knew that **with** the box they saw Milton Berle and **without** the box they saw nothing. It was just that simple.

For seven years or so the FCC ran about the western states pretending they were DOJ officials chasing moonshine whiskey makers. They'd spot an illegal booster and shut it down. If it came back on the air, they'd confiscate the equipment. Which led to the local folks building a new one from scratch. After tiring of this, the FCC finally on their own decided to make boosters legal and they adopted their own rules to allow them to operate. **Illegal boosters became legal translators and everyone was happy.**

If the broadband FM satellite re-distribution system works as well in the states as it seems to work down here, I would not be shocked to find people installing them without licenses. I would also not be shocked to find the FCC reacting to shut them down as they did the early TV booster stations. But, I would hope that history has taught us

all that when there is a better way to get decent television, the people who want that decent television will not be stopped because of some Washington bureaucrat running about the countryside telling them they can't do it. It took seven years to legalize boosters. I'd hope that it takes far less time to legalize the system reported on, here, starting on page 32.

NOVEMBER 19/20

Back on December 19th (stateside time; November 20th in some parts of the world) this writer, accompanied by about a dozen members of the North American TVRO industry, set out from Tokyo's Grand Palace Hotel for a fascinating visit with a Japanese company just three miles outside the city limits of Tokyo. Perhaps you are familiar with the name of the Japanese firm; **Uniden Corporation**.

It was Saturday in Tokyo and Uniden's President **H. Fujimoto** had extended a very unusual invitation to our group of North American TVRO delegates to tour and inspect one of the many Uniden plants in Japan. Uniden should be a name familiar to you; the firm is perhaps the number one importer of telephone type gadgets into the United States, from Japan, and they have bought the services of golfer Jack Nicklaus to be their spokesman before the US media. If your history of electronics is good, you will also recall that Uniden was a very major force in the CB radio world back in the mid 70's shipping at one point more than a million CB radio sets per month(!).

Long before the TVRO group headed for Sri Lanka to visit with Arthur C. Clarke, plans had been drawn for the group to visit with a couple of the Japanese firms who are contributing to the TVRO hardware world. Uniden was one of these firms although at the time, and indeed today early in December, Uniden has yet to ship into the United States the first 4 GHz TVRO hardware.

Uniden has formed a new North American corporation which they call '**Uniden Satellite America**.' Clever people will notice that the abbreviation for this firm might be 'USA.' A major Japanese financial newspaper had announced in mid-October that Uniden was gearing up to become the 'number one supplier of TVRO hardware in the world.' You can be excused for not seeing this announcement since

you probably don't subscribe to Japanese financial newspapers, or read Japanese.

Those who have feared a major invasion of Japanese TVRO hardware from a major Japanese manufacturer can stop worrying about that happening now. Uniden qualifies as a 'major' in every sense of the word and anyone who has been around the electronics world very long must have a well developed sense of admiration for the firm and its dynamic leader.

Before our group took off for Tokyo back on November 17th, I talked about Uniden with a number of friends who are deeply involved in the Japanese electronics world. I mentioned that involved in the 'USA' effort would be a fellow named **John Lane**, the man who turned '**Midland International**' into a household word back in the mid-70's when Midland was the number-one supplier of CB equipment and accessories in the United States. Lane now lives in Hong Kong and he was on hand when we visited the Uniden facility near Tokyo just days ago. Universally, those I talked with gave Uniden, Fujimoto and Lane 'high marks.' "**Uniden is not,**" one said to me, "**one of those Japanese firms that believes in prostituting the marketplace just to take it over.**" That sounded good since I have carried this vision of \$99.95 Japanese satellite TV receivers flooding the marketplace by the boat load, driving everyone else out of the business. "**But,**" my confidant continued, "**they are among the most skilled and dedicated competitors in the electronics world today.**" Bottom line? Well, we'll have to wait and see. Perhaps there will be time between the return from Sri Lanka and the closing deadline for the January issue to give you our group's impressions of what we saw and heard at Uniden. In the meantime, you can be thinking about what it might mean to have Jack Nicklaus appearing on TV screens all over America urging people to drop into their nearby 'USA Store' to pick up the latest in television technology; a Uniden TVRO system.

IF THIS IS Thanksgiving Day . . .

. . . then we must be in Hong Kong? No, actually, we are in Bombay at the world famous Holiday Inn, just adjacent to the Bombay airport on the Indian Ocean. Immediately after leaving Tokyo the Sri

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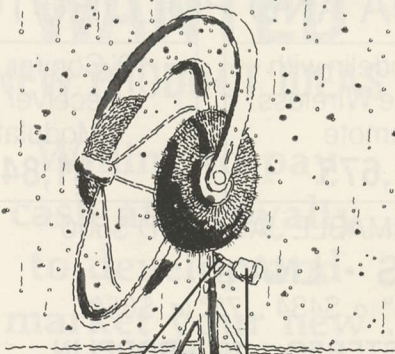
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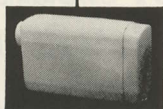
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Lanka group headed west to Hong Kong for a couple of days of sightseeing and ravaging and pillaging of the local shops. When Kevin found an Apple Computer on sale for \$250 that immediately caught our attention. Brand new in the box. In fact there were boxes and boxes of Apple Computers. Well, almost Apples. Here they are called 'Pine-Apples' and they are Far Eastern knock-offs of the popular US designed and manufactured system. Everything is identical right down to the software. Buying one or two or three seemed like a smart thing to do, provided you could figure out how you were going to get it back into the USA. Since the manufacturers have knocked off the Apple design and circuit boards, US laws discourage your bringing in the look-alike copy. Pity, perhaps.

So here it was Thursday November 24th. In Bombay, India. A strange place to spend Thanksgiving; anyone for curried Turkey? On Friday November 25th we will be leaving India for Colombo, Sri Lanka and the Arthur C. Clarke welcoming committee. However, because of the time zone differences, when we arrive in Colombo on India Air shortly after noon it will still be Thursday (and 10 PM) back in San Francisco. Ahead is the considerable task of getting an ADM 20 footer, a Hero 25 footer and a Paracclipse 16 footer all installed and operational before December 2nd. In spite of the excellent food all along the way, anyone who arrives back in the states on December 5th weighing more than when they left will have had to really work at eating! Toiling in the Sri Lanka sun for 8 to 10 hours per day for the next few days should slim everyone involved down several pounds. It is not all work however; the ladies in the group, in particular, are looking forward to a 'formal Tea' scheduled with the President of Sri Lanka on the 28th of November. Everyone, I'm sure, will have a great deal to talk about when we all get back to the states on December 5th.

HBO/GALAXY Fall Out

A not terribly clever series of news leaks and announcements (and denials) continues to appear in the back pages of cable and broadcasting trade press publications regarding the HBO plan to launch a 4 GHz DBS service on Galaxy I. Readers will recall our own in-depth study of that possibility appearing in the September CSD.

First there was a release from a group of engineers at Hughes who claimed that their tests proved conclusively that a six foot dish equipped with modern electronics would provide a high quality picture from Galaxy I virtually anywhere in the 48 states. We can do them one better; reader Larry Lannigan recently installed a 12 foot dish in Hawaii and he found both of the (Spanish language) Galaxy I signals totally clean there. Hughes was 'of course' doing this testing on their own, and there is no way one could tie the results of the tests to HBO directly.

Then there was the story that confirmed that Turner and ESPN and USA Network had been 'talking with' HBO regarding the packaging of these three F3R signals into a kind of 'DBS-Basic' service for possible use on some 'unnamed' bird. HBO merely admitted that they were exploring possible programming options.

And then we have the on-going 'leaks' concerning HBO discussions with various creators of sophisticated scrambling systems. Our own CJR for November looked at the real-world state of the Linkabit, DVS/S-A, MAAST and Orion scrambling systems and revealed that something called LSI (large scale integration) techniques allowing the mass-production of 'cheap' (addressable) descramblers is coming early in 1984. The same issue of CJR also reports on the status of video descrambling and comes to the conclusion that digital is 'in' and pirate viewing is going to be a thing of the past, soon.

Through all of this, HBO is sending up 'trial balloons' designed to 'test the waters' without getting wet. It is a familiar ploy; admitting nothing directly, news stories are planted and published and industry and reader reaction measured. From all of this there develops a consensus of public and private opinion. Without ever admitting that a 4 GHz DBS service is on the drawing boards, HBO is getting all of the feedback it wants. And then some.

Those not familiar with this tactic are already getting anxious, wondering just 'when' such a 4 GHz DBS service might really begin. There is no rush; we don't expect a formal announcement much before mid-1984 and we would be surprised to see anything approaching a service date prior to 1 January 1985. If you are a TVRO dealer wondering just how the scrambling of the 4 GHz present-generation 'premium' programming channels is going to affect your

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business in 1984, we suggest you go back and carefully read the status-of-scrambling report in the November **CJR**. When you fully understand the capabilities of the latest generation of scrambling equipment, then, perhaps, you will see that scrambling **will play** an important part in the future of your business in the years ahead.

A NEW YEAR Ahead

As we roundout the biggest and most productive and most exciting year in the home TVRO industry to date, there is time to reflect on what the new year will bring.

It has become a tradition for **CSD** to select an industry 'Man Of The Year' and we nominally do this with our January issue. We also usually feature the 'Man Of The Year' selection on the front cover of the January **CSD**, along with some words about why we feel this particular person deserves to be recognized by his industry for outstanding achievement(s). There has been the usual last minute politicking directed towards me regarding the selection of the 1983 'Man Of The Year.' Some has been subtle, some has been very direct. Actually, my tentative decision and selection was formulating back several months ago. The person I had in mind had established himself as a dynamic industry leader during 1983 and his innovations in his area of expertise were very impressive indeed. With a couple of also-ran selections in the back of my mind I began concentrating on the 'leader' and the other contenders during the last four months of 1983.

Our January issue cover will feature Arthur C. Clarke, in Sri Lanka, in a photo of what we earnestly **hope** will be he tuning in his first Clarke Orbit belt 4 GHz satellite signals in his home. How we deal with the 1983 'Man Of The Year' selection will simply have to remain a surprise until the January issue rolls off the presses.

That 'housekeeping' business aside, my own crystal ball suggests massive industry maturity during 1984. There is no way the industry can go through 12 months of industry wide national financing, and not change. There is no way the industry can face the first serious (Uniden) importation of high tech, low-cost Japanese hardware, and, remain the same. There is no way we can continue the senseless blood-letting war over industry shows, and, remain the same. And, there is no way we can awaken to find two and probably more of our 'premium service' channels scrambled (and gone), and remain the same. My detailed prognostications for 1984 are taking shape as you read this. Fortunately I have plenty of willing help from people who have their own pet theories to recite. 1984 will be a pivotal year for the industry and not everyone is going to make it through all 12 months 'whole.'

1983 was more than a year of rapid growth. It was a year during which we faced for the first time the reality that dish sizes cannot continue to be telescoped downward while still maintaining quality service to purchasers. It was also a year when block down conversion techniques moved out in front as a serious contender for viewing dollars. 1983 was a year when a big percentage of the dealers decided that 100 degree LNAs should be the 'standard' and 120 units ended up clogging warehouse shelves.

On the political side, 1983 was a year where SPACE finally got its focus directed at serious ways to keep the industry alive and healthy and the 1983 Board of Director elections saw some amazing changes in the political alignments. More than ever, 1983 was a year where, for SPACE at least, those with the dollars to 'play' became the influential leaders in directing the future course of the industry itself.

1983 was also a year where some very big entertainment names with very big bucks to spend found out they could not simply 'buy' their way into the satellite entertainment world. CBS dropped \$35,000,000 on its cable service channel, and quit. RCA dropped \$30,000,000 on The Entertainment Channel, and quit. SNC dropped \$25,000,000 or so of Westinghouse and ABC money, and quit. The Health Channel went through a major shakeout and The Weather Channel is hanging on by its teeth. The Movie Channel tried to quit, and ended up as a part of the Showtime venture. And Spotlight . . . well, 750,000 cable subscribers did not a profit make.

All of this has had an unsettling effect on those who perhaps prematurely viewed the use of a transponder on a satellite as a ticket to fame and riches. Gold mines, especially in the 'sky,' as mythical as 20 watt C band transponders.

All of which sets the stage for the year ahead, and our overall look at what it may bring us, in the January issue of **CSD**.

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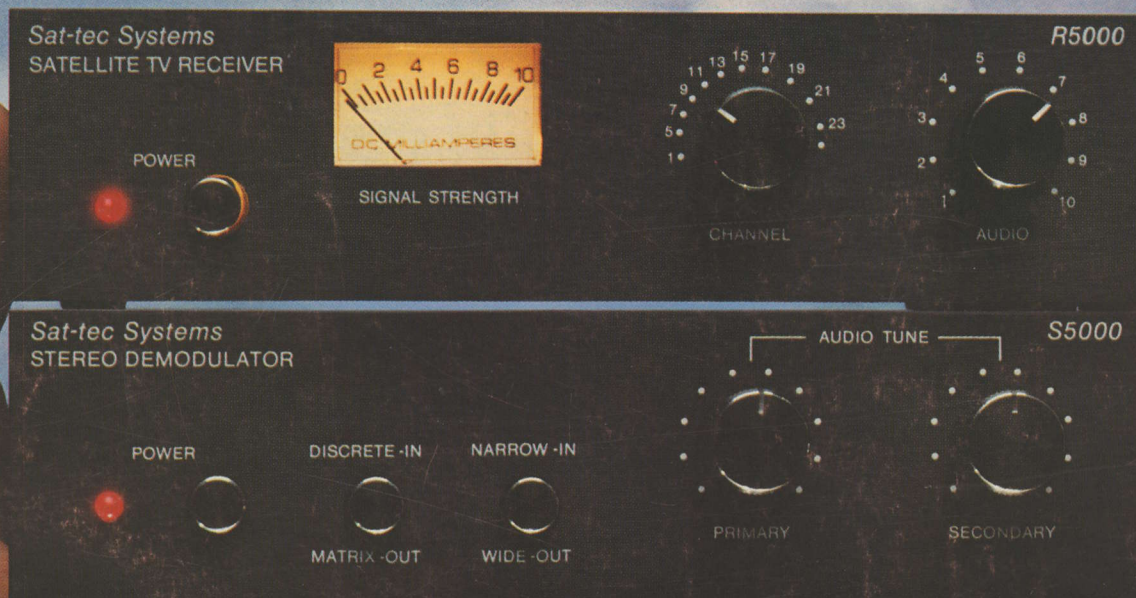
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